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1 family 1 handyman



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OCTOBER/NOVEMBER 2024

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Let's Get Growing!

Fall is here, and it's houseplant season



Like a lot of people, I became obsessed with houseplants in 2020. Spending more time than usual at home, with my main form of entertainment consisting of combing the aisles at Lowe's and Home Depot, I snapped up nearly every plant I could find. Fiddle-leaf figs. Philodendron. Monsteras galore. They all found prominent display places—everywhere and anywhere.

Flash-forward to today, and my home is just as green. And, happily, I've picked up some new skills, from potting to propagating. Now, if you've got tips on how to not overwater your plants, this is a skill I've yet to master—so I'm all ears!

Tending to plants can truly be a full-time hobby. And there are always ways to take your passion to the next level, as proved by our cover project. This "living wall," designed and built by our Senior Project Editor Carmen De La Paz, is a wonderful example of form meets function. On the surface, you have a beautifully composed grid of slats and planters. Its frame hides the lighting and hoses

for a filtration system. Yep, this living wall is self-watering. So if you're looking to build your plumbing as well as carpentry skills, this is the project for you.

On a smaller scale, we've got the how-to for creating an indoor herb garden, an open terrarium and a closed terrarium. They should keep you busy on a blustery fall day, and keep you in a sunny state of mind through winter.

If you're in need of an office pick-me-up, our Mini Makeovers section has organization, supply and decor ideas, as well as an easy how-to on building a tabletop desk. And we're also putting bathroom tech in the spotlight, because there's no better time to make your bathroom feel like a luxury spa than in fall and winter.

As always, we want to hear from you! Send us your finished projects, and they may appear in our Show & Tell section. And, as always, we love your tips for our Handy Hints section. You can submit photos and information online at familyhandyman.com/submissions.

The DIY world is all about sharing knowledge and learning from each other's successes and failures. That's what makes this crazy thing we all do so special. And that's what makes each issue such a joy to present to you.

A handwritten signature in black ink that reads "Kelly Aiglon".

Kelly Aiglon, Deputy Editor



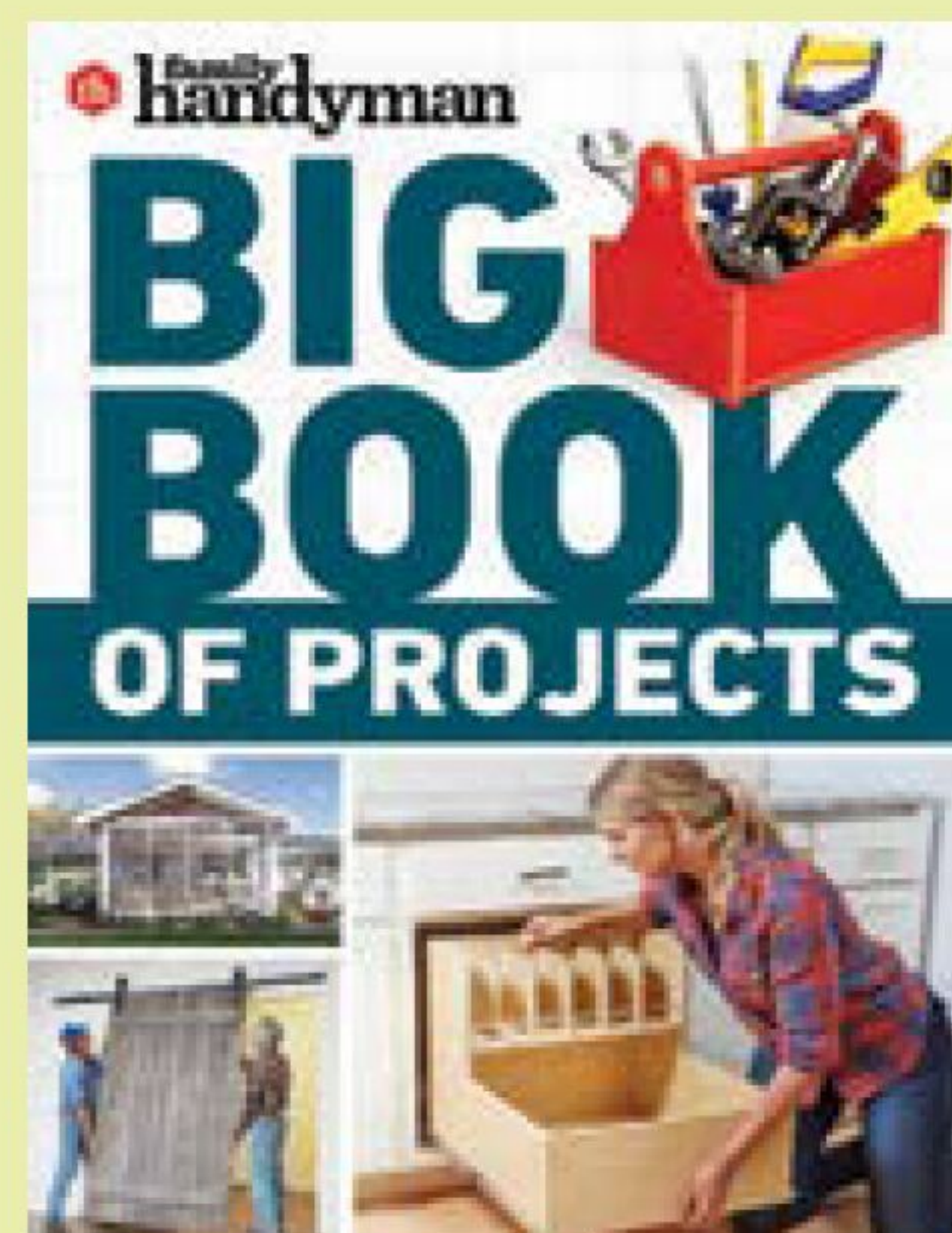
Win \$5,000 for a Talented Pet Video!

Have you captured your pet's hidden talents on camera? **The Pet Collective** (a sister brand to **Family Handyman**) just launched the World's Most Talented Pets Video Contest. Share your video by scanning the QR code below, and you could win the \$5,000 grand prize! The contest ends Nov. 15, 2024—so don't wait!



Submit Here

Scan the QR code to enter the contest.



The Big Book of Projects Is Here

Fasten your tool belt, because the *Family Handyman Big Book of Projects* has 40+ detailed plans to enhance and add value to your home, from kitchen and bath improvements to storage solutions. Get it now for \$10—shipping is free. Order at familyhandyman.com/PROJ4.



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Contents

October/November 2024



What's New

- 9 Now Trending**
Fresh uses for tried-and-true pegboards.
- 10 Gear Up**
Stay sharp with the cutting edge of tools.
- 14 Mini Makeovers**
Reorganize and refresh your home office.

Toolkit

- 53 Best Pro Tips**
Rev up your knowledge of car care.
- 56 Fix-It Focus**
Solve any crack, hole or bubble in your wall.
- 60 Handy Hints**
Sandpaper secrets to make your job easier.



Features

- 20 Build a Plant Wall**
Make a wooden display complete with a watering system.
- 26 DIY Home Theater**
Elevate game day and movie night with surround sound.
- 30 3 Green Projects**
Follow step-by-steps to create an indoor herb garden, as well as open and closed terrariums.
- 40 Bathroom Tech**
An essential guide to voice-activated features, plus how to install heated floors.
- 48 Vacuum Guide**
From handholds to uprights, find the best buy for your buck.

Also in this issue

- 2** Editor's Letter
- 6** At Home with Family Handyman
- 63** Reader Info
- 64** Show & Tell

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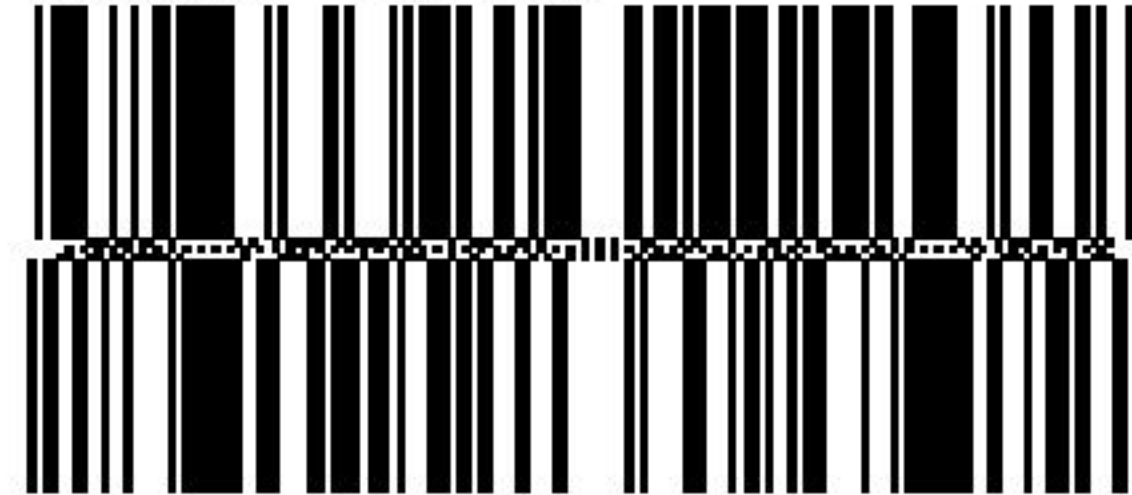


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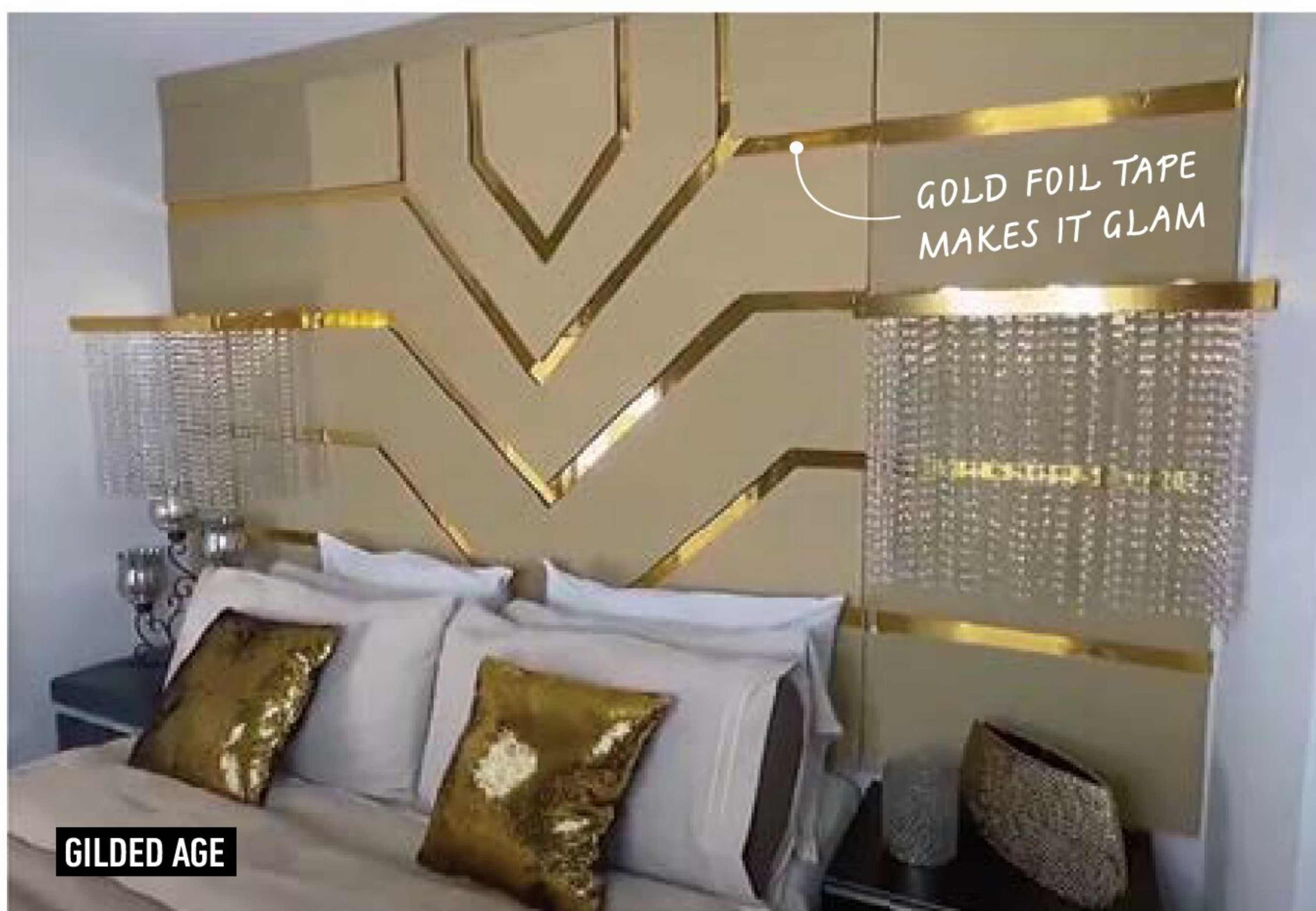
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One Project, Two Ways

On a recent episode of *Who Built It Better?*, two DIYers went headboard to headboard



It's easy to jazz up a bedroom, proved two hobbyists. On a shoestring budget, they took headboard building in different directions: one sleek and regal, and one glam and art deco. While the results are different, both add up to an upgrade that anyone can do in a few hours.
—Kelly Aiglon

And the Winner Is ... Fit for a Queen!

To crown a champion, these projects were judged on a range of criteria, including:

- **Budget: Gilded Age**
With less than \$100, this headboard was achieved with poster board, fabric and gold foil tape.
- **Quality: Fit for a Queen**
A lumber frame, thick foam and batting make this one built to last.
- **Ease of Build: Fit for a Queen**
No complicated measuring here—just layering of materials, with gold embellishments for flair.
- **Fun Factor: Fit for a Queen**
Simple yet satisfying, this project has elegant results.



See these projects come to life on *Who Built It Better?* on **At Home with Family Handyman**, and get more inspiration by streaming the channel free at [FamilyHandyman.com/tv](https://www.familyhandyman.com/tv).

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TRYING AN ALTERNATIVE

Everyone feels aging pain, but CBD can help

By: **Beth Giles**

Life really does fly by. Before I knew it, my 60s had arrived, and with them came some new gifts from dear ol' Mother Nature—frequent knee pain, stress, low energy and sleeplessness. Now, I'm a realist about these things, I knew I wasn't going to be young and springy forever. But still, with "golden years" nearly on my doorstep, I couldn't help but feel a little cheated. That is until I found my own secret weapon. Another gift from Mother Nature.

It began a few months back when I was complaining about my aches and pains to my marathon-running granddaughter, Jen. She casually mentioned how she uses CBD rub to help with her joint pain. She said that CBD gave her more focus and clarity throughout the day and that her lingering muscle and joint discomfort no longer bothered her. She even felt comfortable signing up for back-to-back marathons two weekends in a row this year. That made even this self-proclaimed skeptic take notice.

But I still had some concerns. According to one study in the *Journal of the American Medical Association*, 70% of CBD products didn't contain the amount of CBD stated on their labels. And, as a consumer, that's terrifying!

If I was going to try CBD, I needed to trust the source through and through. My two-fold research process naturally led me to Zebra CBD.

First, I started calling my family and friends. Call me old fashioned but I wanted to know if there were people whom I trusted (more than anonymous

testimonials) who've had success using CBD besides my granddaughter.

Secondly, I wanted cold hard facts. Diving deep into the world of CBD research and clinical studies, I came across Emily Gray M.D., a physician at the University of California at San Diego (UCSD) Medical School and medical advisor to Zebra CBD who is researching the effects of CBD. Dr. Gray wrote "early results with CBD have been promising and we have a lot of research underway now. I've had several patients using CBD with good success. It's important that you know your source of CBD and how to use it properly."

After hearing it from the doctor's mouth, I returned to my research, asking more people and was amazed by the number of close friends and family who were already on the CBD train. Apparently, I was the only one without a clue! And funny enough, a couple of friends who commented were using the same brand as my granddaughter—Zebra CBD. There was no consensus as to why they were using CBD, but the top reasons given were for muscle & joint discomfort, mood support, sleep support, stress and headaches, as well as supporting overall health & wellness.

Eventually, even the most skeptical of the bunch can be won over. With a trusted CBD source in mind, I decided to give it a go.

When I viewed Zebra CBD's selection online, I was impressed by its array of products, including CBD oils called tinctures, topicals, chewable tablets, mints and gummies. After reading on their website

that all their products are made with organically-grown hemp, I ordered... and it arrived within 2 days!

The first product I tried was the Rub. Now this stuff was strong. Immediately after rubbing it on my knee, the soothing effects kicked in. It had that familiar menthol cooling effect, which I personally find very relieving. And the best part is, after two weeks of using it, my knee pain no longer affected my daily mobility.

The Zebra Sleep Gummies, on the other hand, had a different but equally positive effect on my body. To take it, the instructions suggest chewing thoroughly. This was simple enough, and the taste was, well, lemony. After about 15 minutes, a sense of calm came over my body. It's hard to describe exactly; it's definitely not a "high" feeling. It's more like an overall sense of relaxation—and then I fell fast asleep. Needless to say, I slept great and woke up refreshed. I haven't slept like that in a long time.

While it hasn't been a catch-all fix to every one of my health issues, it has eased the level and frequency of my aches. And it sure doesn't seem like a coincidence how rejuvenated I feel.

All-in-all, CBD is one of those things that you have to try for yourself. Although I was skeptical at first, I can safely say that I'm now a Zebra CBD fan and that I highly recommend their products.

Also, I managed to speak with a Zebra CBD spokesperson willing to provide an exclusive. If you order this month, you'll receive \$10 off your first order by using promo code "**FH10**" at checkout. Plus, the company offers a 100% No-Hassle, Money-Back Guarantee. You can try it yourself and order Zebra CBD at ZebraCBD.com/FH or at 1-888-762-2699.

What's New

Now Trending • Gear Up • Mini Makeovers

The latest
we've heard,
seen, tested
and tried

NOW TRENDING

Pegboard Ingenuity

Gone are the days of only using pegboards to hold your spare screwdrivers. The perforated hardwood is proving to be quite versatile in any room of your home, hoisting everything from plants to spices to spare keys. For a real showstopper, use pegboard to create an entire accent wall, where it can display art and household essentials with equal panache. —**Kelly Aiglon**



The Cutting Edge

Sharp bits and blades help you work quickly and precisely.
Our editors put the latest and greatest to the test.

Classic Multitool Gets an Upgrade

The Leatherman Wave+ isn't your average pocketknife. This 4 x 1-in. powerhouse—an updated version of the original Leatherman Wave—boasts 18 useful tools, from needle-nose pliers and spring-action scissors to a saw, a diamond-coated file and a can opener. The one-handed opening mechanism makes features like the pliers and knife quick to access, though others require two hands to open. Once you've accessed the tool you need, a locking mechanism springs into place to make sure it stays put. No matter how I used this tool—sawing small pieces of wood, screwing together furniture, bending and crimping wire—its parts didn't budge.

Notable upgrades to the Wave+ include ergonomic improvements like rounded edges and thumbholes in the retractable blades, as well as dual-purpose replaceable wire cutters. If blades become dull or damaged, simply swap in a new pair and keep on snipping.

At \$120, the Wave+ will set you back a bit more than your standard hardware store find. But with made-in-the-USA quality and a 25-year warranty, it's a worthwhile investment for DIYers or people who like to be prepared for anything. —Allison T.S. Robicelli, Home writer and product tester
Leatherman Wave+, \$120; leatherman.com, backcountry.com, Amazon

VIA LEATHERMAN

I'm thinking more today about how to protect the money I've earned.

I've learned a lot of things over the years, talking to all sorts of experts in all sorts of fields. But one of the most important lessons I learned was from two former Directors of the U.S. Mint, who taught me everything I needed to know about the importance of protecting my savings with physical gold and silver.

In 25 years of working dirty jobs, the thought of a diversified portfolio really didn't cross my mind—but the more I learn, the better I feel about buying gold and silver from U.S. Money Reserve.

Is gold right for you? That's not for me to say. You've got to do your own due diligence. All I know is that today, it's not enough to simply work hard—you also have to save smart. **So, visit the link or call the number below. The folks at U.S. Money Reserve are standing by to help.**



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What's New Gear Up

Ditch Dull Drill Bits

As a professional woodworker, I know that sharp drill bits are essential. But freehand sharpening is tricky, and the cost of replacing bits can quickly add up. That's where the Drill Doctor 750X comes in. This user-friendly drill bit sharpening system precisely centers the bit and grinds at the perfect angle to restore even broken bits to life. I tested the machine in my workshop and came away impressed with its accuracy, consistency and versatility.

The 750X can sharpen a wide range of bit styles, from standard 118-degree to split points (great for preventing drill bit wandering). The chuck accommodates up to a 3/4-in. bit, and it includes long jaws for optimum grip of even the smallest bits from 3/32 in. And various bit materials are supported, including carbide, cobalt and black oxide.

Holding the drill bit securely using an angle guide, the diamond grinding wheel removes work material, making the sharpening process quick and straightforward. All you have to do is set the bit and rotate. When the time comes, the diamond wheel is also easy to replace.

There's a bit of a learning curve, but the included instructional videos help get you up and running quickly, and soon enough, you will be sharpening bits like a pro, in about 2 minutes each.

—Cathy Harms, Owner of Charms Woodworks
Drill Doctor 750X, \$160; drilldoctor.com, acmetools.com, Lowe's, Amazon



Power and Precision at the Right Price

When the time came to replace my old hand-me-down miter saw, I kept coming back to one model: the Skil 10-In. Dual-Bevel Sliding Miter Saw. More versatile and powerful than my old 7 1/2-in. miter saw, it's also roughly half the price of similar saws by competitors like Dewalt or Ridgid.

Right out of the box, this light yet sturdy saw packed a punch, effortlessly ripping through various wood types and making perfect straight and bevel cuts. When cutting miters, I loved how the saw would immediately slip into the more common angle slots, 11 in all. The blade spun up quickly and stopped near-instantaneously when I removed my hand from the safety lever.

Clean and
accurate
cuts



That said, a few minor drawbacks are worth noting: The dust collection system isn't great, and the shadow line feature doesn't show up well on sunny days outdoors. But these quirks are easily overshadowed by the incredible value the saw offers. For DIYers and weekend warriors who crave clean cuts, affordability and portability, this saw is a dream come true. —Robert Annis, Tool reviewer and DIY woodworker

Skil 10-In. Dual-Bevel Sliding Miter Saw, \$249; Lowe's, Walmart, Amazon ●

VIA DRILL DOCTOR; VIA SKIL

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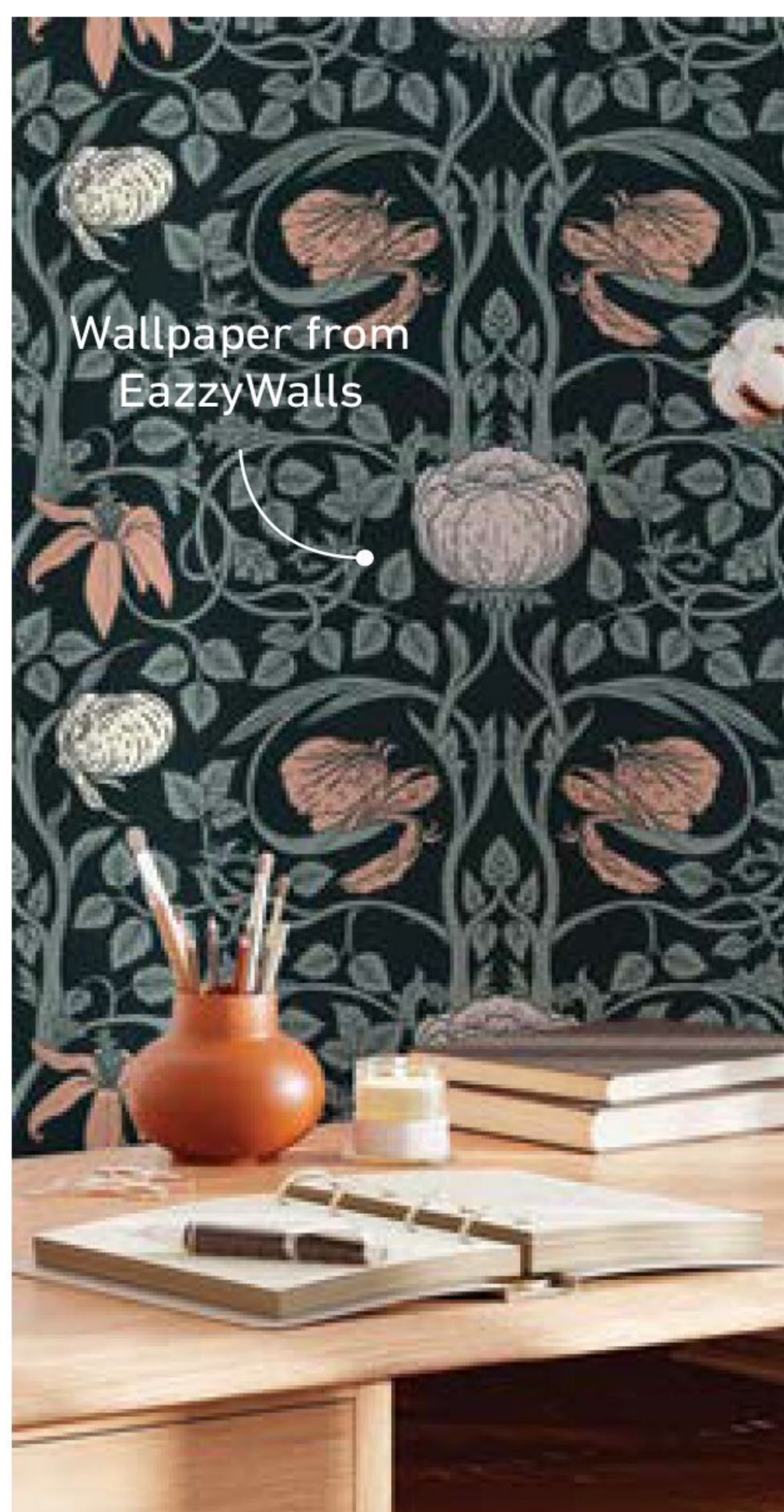
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Down to Business

Does your home office need an upgrade? We're here to set you up for success with an easy desk project, editor-approved accessories and plenty of inspiration.

BY FAMILY HANDYMAN EDITORS



GET INSPIRED The Un-Boring Home Office

When you have an inspiring home office, work doesn't have to feel like work. Here are some design ideas (one's as easy as hanging pictures on the wall!) you can run with to make this room both pretty and productive.



GEAR UP

Deck Out Your Desk

These bright accessories will make your home office a happier place

1. Industrial Lamp

Made of metal, with a wood base, this lamp is the workhorse any office needs. It's made for E26 standard light bulbs, with a curvy twist: They hang Edison-style. Create a more glowy atmosphere for Zoom calls or just enjoy it for the pop of color it adds to your desk. Bonus: It has a rotary switch for ease. \$25, [walmart.com](https://www.walmart.com)

2. Colorful Pens

Jotting down notes (or doodling) is more fun when you think beyond the average ballpoint pen. Erin Condren's Gemtones Gel Pens are perfect color-coding companions for your planners, notebooks and journals. With water-based gel ink, they give you clean, precise lines and a smooth, easy writing experience. \$19/6-pack, [amazon.com](https://www.amazon.com)

3. Laptop Case

If you've got MacBook scratches that can't be removed with a micro-cloth, it's time for a case to prevent future damage. This colorful option comes with covers for the top and bottom of your laptop. The bottom cover has a vent to keep your laptop from overheating, and there are two easily accessible ports. \$45, us.burga.com

4. Essential Trio

Three is perfect company when it comes to keeping the important things close at hand. The proof is JAM Paper's vibrant Orange Office Desk Set, which includes a stapler, pen holder and tape dispenser. In attention-grabbing orange, it's exactly the wake-up call you need before diving back into those spreadsheets. \$30, jampaper.com

HOW-TO

Build an Easy Stand-Up Desk

In less than 30 minutes, you can turn any table in your home into an ergonomically friendly place to get some work done



Step-by-Step Instructions

Scan the QR code to see the full project plan online.



1 CUT PLYWOOD TO SIZE

Cut a 24 x 14-in. piece of $\frac{3}{4}$ -in. plywood. (This will be your desktop). Use a table saw to make the cut (a circular saw will work if you don't have a table saw).



2 MARK AND CUT THE APRON SIDES

Cut a 1x3 to 14 in. to match the depth of the plywood top. Cut both sides, and glue and nail them flush with the top and edges of the plywood.



3 FASTEN THE BACK AND FRONT APRONS

Mark and cut these parts the same way you did the sides. Hold the 1x3 flush to the corner and mark the other end.

Glue and nail the front and back pieces so they overlap the sides.



4 ATTACH THE LEG HARDWARE

Place the hardware in the corners, drill pilot holes and screw them into place.



5 SCREW ON THE LEGS

Screw the legs into the leg brackets, then flip it over. Sand every inch of the top surface to avoid splinters.

Paint to match your decor or finish with polyurethane for a natural look.

QUICK TIPS

6 Organization Ideas

Here are secrets to keeping the clutter low and the productivity high



Use Wall Space

Make your walls functional by mounting a corkboard, whiteboard, chalkboard or magnetic surface to the whole wall. Use this to pin current projects, inspiration, calendars, to-do lists, memos and more!

Put Paperwork in a Pot Lid Holder

Borrow from the kitchen! Use a kitchen pot lid stand to organize your desktop's most current paperwork. A simple wooden dowel-style holder can easily be painted to match your decor.

Put a Tag on It

Label bins, drawers and containers with gift tags for an attractive yet functional way to stay organized. After-Christmas sales are a great time to get gift tags cheap, or you can find inexpensive yard sale tags year-round.

Use Shoeboxes for Storage

To make sure you've got room for everything, try this easy closet storage hack: Fill clear plastic shoebox containers, like Walmart's Sterilite set, with craft or office supplies, and label the front for easy view. Then stack them on top closet shelves.



Hide Electronic Eyesores

The cables and wires from the electronic devices sitting on your desk look pretty bad when they're left to hang in the wind. So mount a cable organizer under your desk to tuck, wrap and stow your cables. Even if cables are visible, tidying them up will make them far less unsightly.

Color-Code Cord Ends

Use different colored Washi Tape for a nonpermanent way to match cords end to end. No more unplugging the wrong cord when you run out of the room. ●

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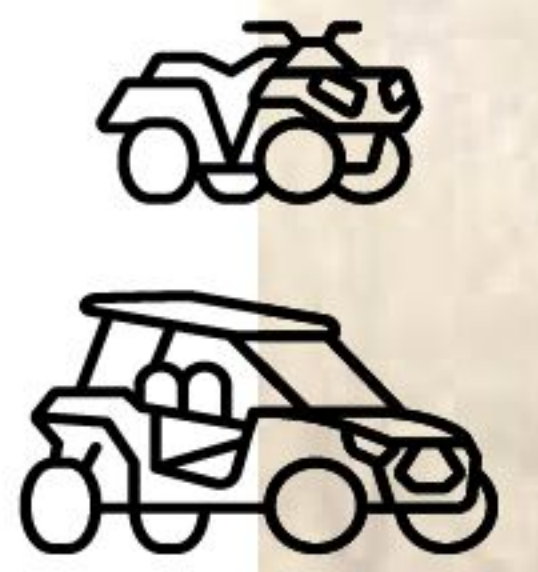
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2-3 days	\$600-\$1,200	Intermediate

- Tools**
- 18-gauge brad nailer
 - Clamps
 - Drill bits
 - Drill/driver
 - Hammer/mallet
 - Level
 - Miter saw
 - Nail set
 - Painting/staining supplies
 - Pocket hole jig
 - Speed square
 - Stud finder
 - Table saw
 - Tape measure

MODERN & MODULAR Living Wall

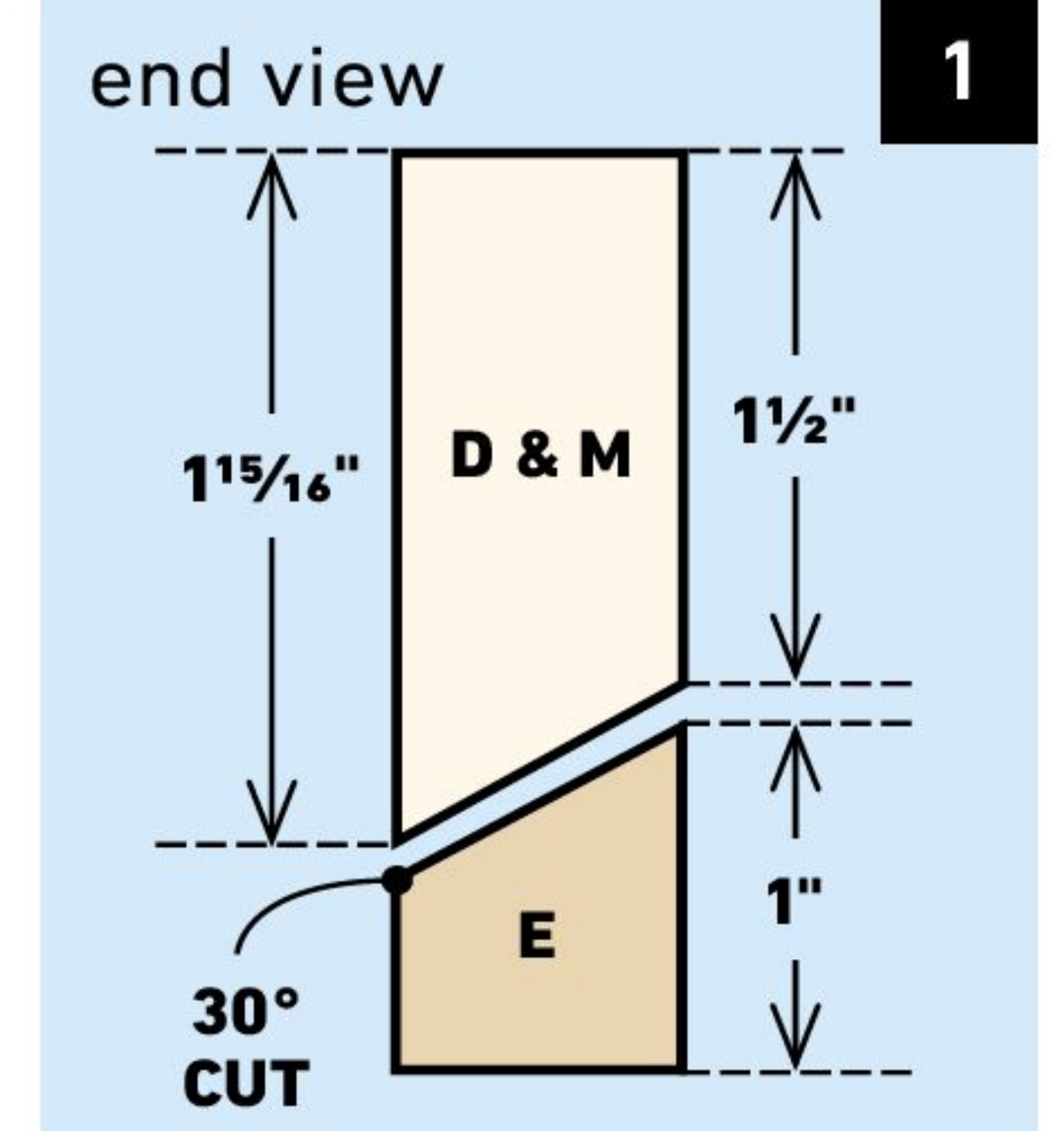
This centerpiece build turns your favorite houseplants into a work of organic art

BY CARMEN DE LA PAZ

Plants have the power to transform just about any living space. So if, like me, you love houseplants but have been keeping them in pots on the floor or sitting on a side table near a window, here is your sign: It's time to mix up your approach and harness their incredible potential. This living wall has been meticulously designed with every detail in mind. The modular elements can be adjusted as your houseplants grow. An integrated drip system allows for convenient watering without the need for a stepladder to reach the top layer. And to top it all off, accent lighting and a grand scale turn this stylish build into a true statement piece.

1 CUT THE CLEATS

Using a table saw, rip a few 1x4s at a 30-degree angle so the shorter face of the rip is 1½ in.—these are your box cleats (D) and frame cleats (M) and mimic the dimensions of the box slats (C). Then rip the straight side of each offcut so that the long face is 1 in.—these are your wall cleats (E).



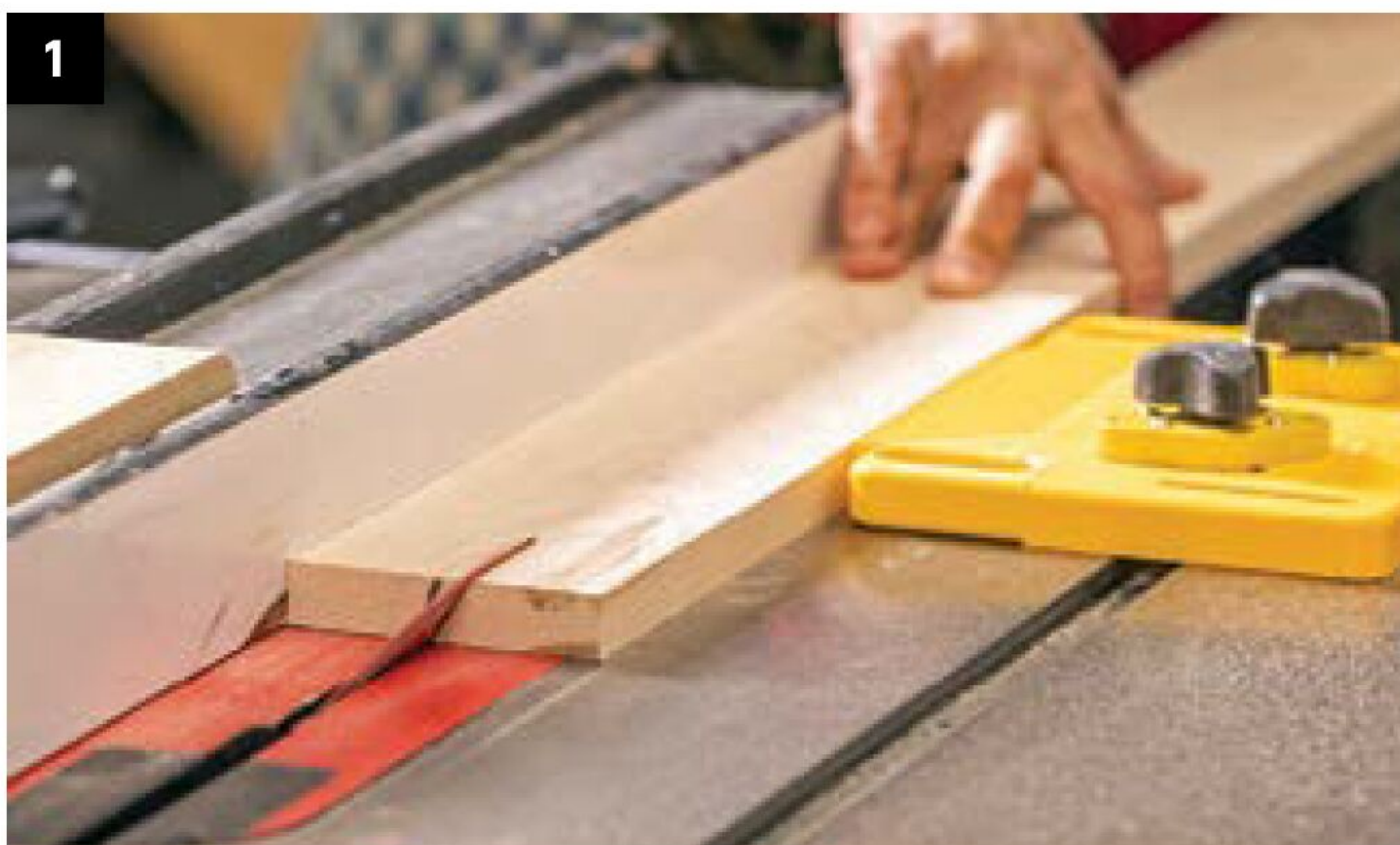
without having to cut into tight spaces with a paintbrush and rag, which can leave lap marks. Let the stain dry overnight, then cut the pieces to size following the cutting list on page 22.

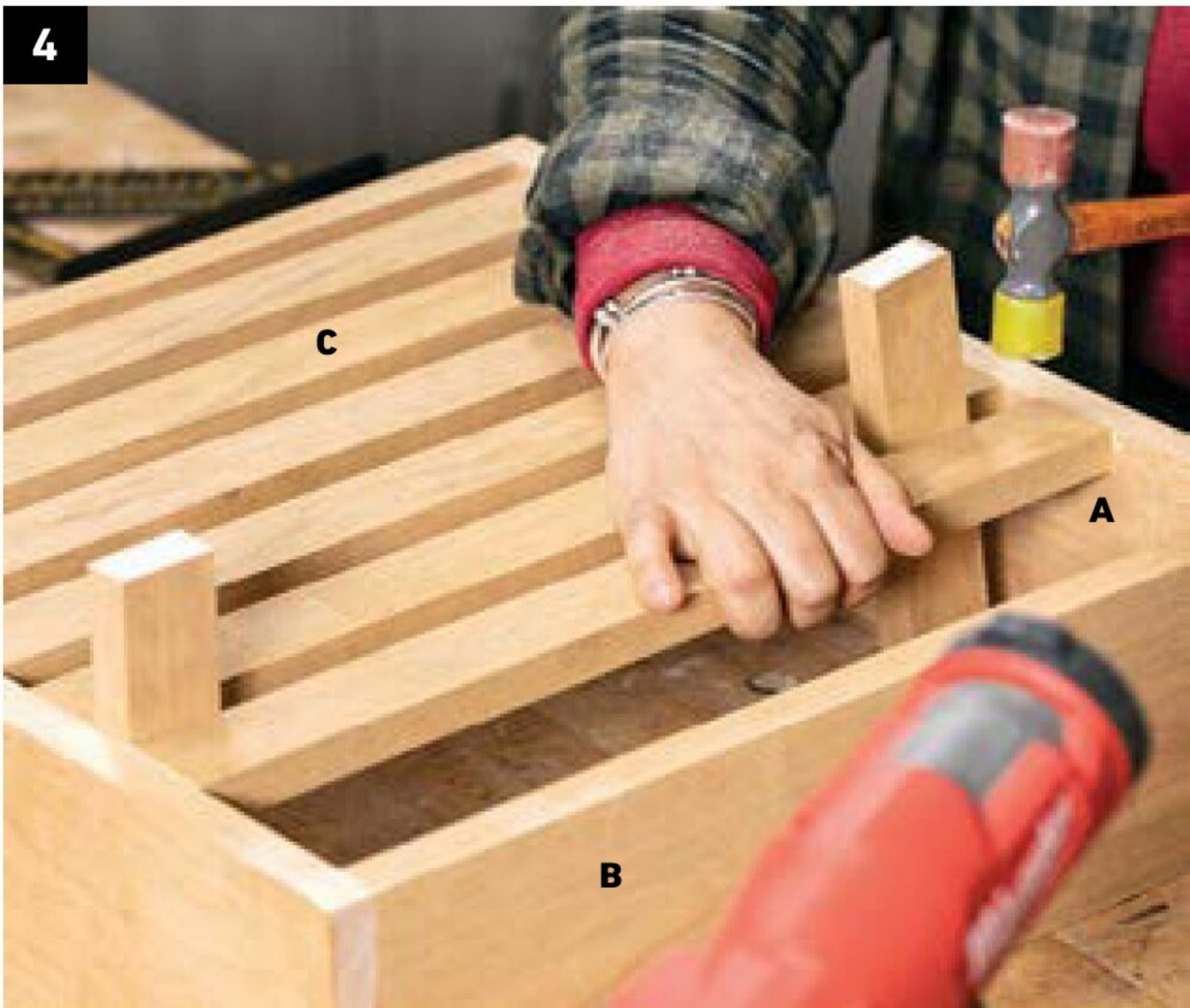
2 PRESTAIN AND CUT

Before cutting all the boards to their finished sizes, stain the boards for all the parts except for the wall cleats (E). This way, you can touch up the stain once the unit has been put together

3 NAIL TOGETHER THE BOX FRAMES

The unit contains nine 18 x 18-in. boxes, each





Materials

Item	Qty.
1x2 x 8' maple	7
1x4 x 8' maple	3
1x6 x 8' maple	15
1½" brad nails	
1½" pocket screws	
1½" screws	
2" angle brackets	
2¼" screws	
320-grit sandpaper	
CA glue	
Double-sided tape	
Drywall anchors	
Polyurethane	
Rope light	
Shop rags	
Stain	
Wall paint	
Watering system and vessel for water tank	
Wood filler	
Wood glue	

Cuts

Key	Qty.	Dimensions	Part
A	18	¾" x 5½" x 18"	Box tops and bottoms
B	18	¾" x 5½" x 16½"	Box sides
C	31	¾" x 1½" x 16½"	Box slats
D	9	¾" x 11½" x 16½"	Box cleats
E	9	¾" x 1" x 16"	Wall cleats
F	5	¾" x 5½" x 18"	Planter faces
G	2	¾" x 5½" x 57"	Shadow box top/bottom
H	2	¾" x 5½" x 55½"	Shadow box sides
J	4	¾" x 5½" x 66"	Frame pieces
K	1	¾" x 5½" x 35"	Cleat support top
L	2	¾" x 5½" x 35"	Cleat support sides
M	2	¾" x 1½" x 33½"	Frame cleats

Note: This cutting list is specific to the wall shown, which has two vertical- and horizontal-slat boxes each and five planter boxes.

*One edge ripped at 30 degrees

**With 45-degree miters at each end

of which has an outer frame made up of a top and a bottom (A) and two side pieces (B). For each box, join the top and bottom with the sides to create a square. Use wood glue and 18-gauge brad nails with at least three nails joining each corner.

4 BUILD THE VERTICAL-SLAT BOXES

For the two vertical-slat boxes, install the first slat (C) in the center of the square box frame, then work

your way to the left and right to install three more slats on each side. Leave a ¾ in. gap between the slats, gluing and nailing them flush to the top edge of the box top and bottom (A). Use at least two nails to secure each end of each slat in place. Use a Speed square to keep your slats square to the box.

When all the slats are attached, flip over the box and install the box cleat (D). This is nailed into the box top (A) and side (B) behind the slats and flush to the back edge of the box, with the point of the 30-degree angle pointing down along the box's back edge. Secure the box cleat with at least four nails through the top and sides, then reinforce it with screws, as it will bear all the weight of the box.

5 BUILD THE HORIZONTAL-SLAT BOXES

Install the box cleat (D) flush to the top, back edge of the top (A) and sides (B) of the two horizontal-slat boxes using the same process described in Step 4. Then leave a 1½-in. gap so that you have room to insert the wall cleat (E) through it when hanging it, and attach the six remaining slats (C) with even gaps (a hair under 15/16 in.) between them.

Be sure to test your first box with a wall cleat (E) to ensure it works before moving on to the other boxes.

6 BUILD THE PLANTER BOXES

For each of the five planter boxes, install the box cleat (D) just as you have on the vertical- and horizontal-slat boxes.

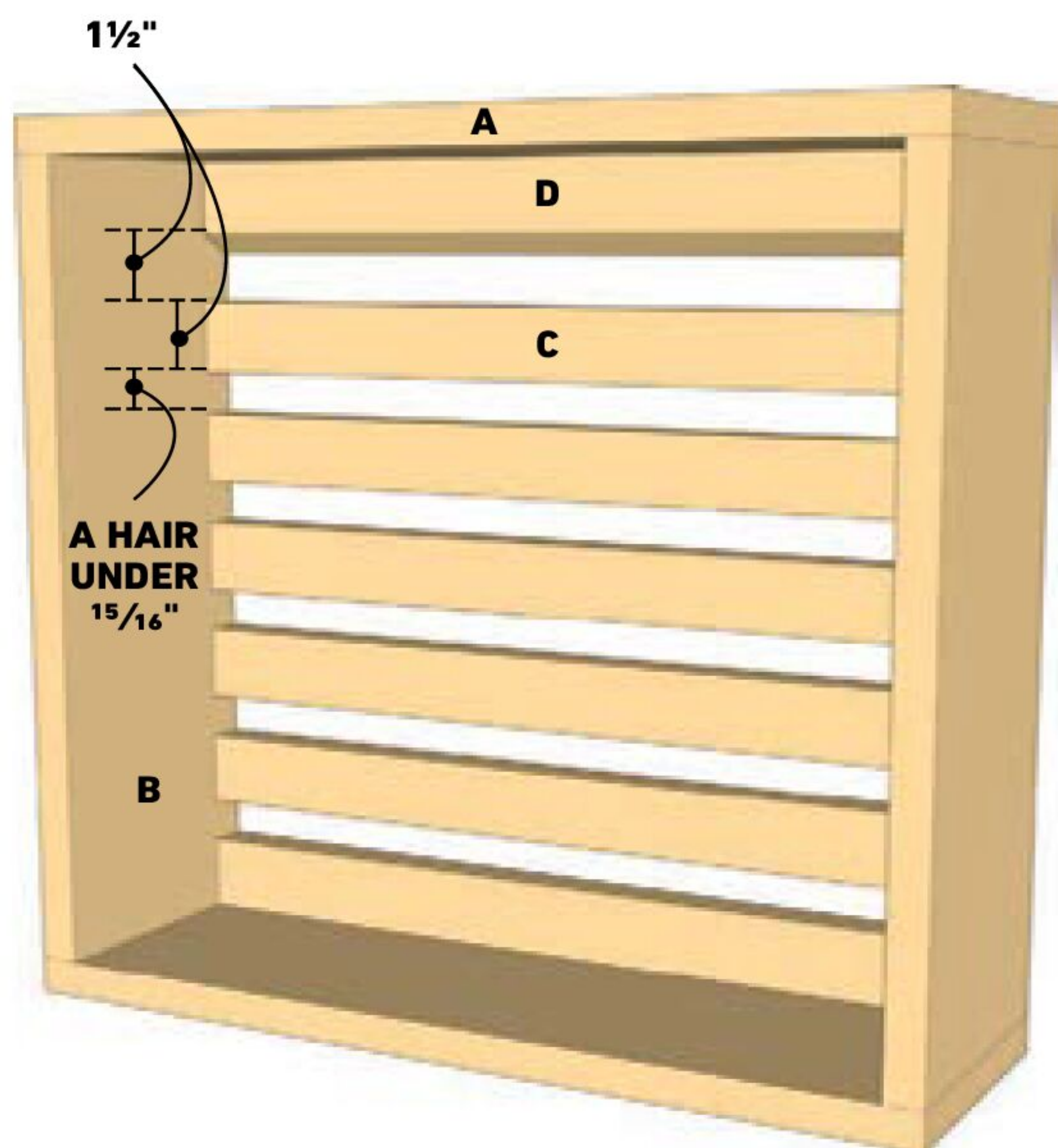
To hold a plastic plant liner or square pot in place, attach a single box slat (C) at the back bottom of the planter box, just like the very bottom slat (C) of the horizontal-slat boxes, using 18-gauge nails and wood glue.

Attach the planter face (F) flush to the front edge of the bottom (A) and sides (B) using 18-gauge nails and wood glue.

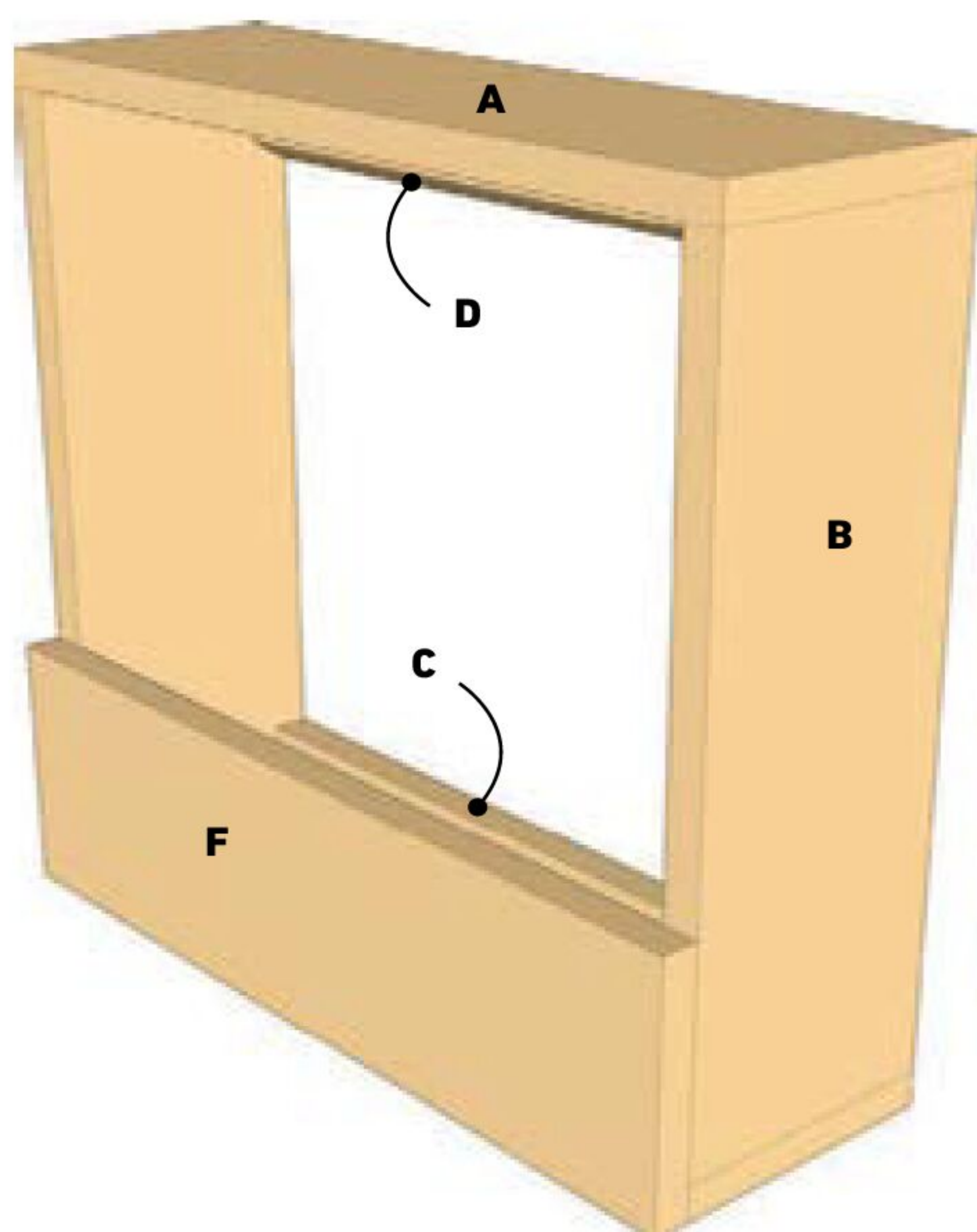
To create a dimensional detail (and let your creativity run wild), cut scrap 4x4s, 2x4s, 2x2s and 1x2s into ¼-, ½- and 1-in. lengths. After staining the pieces, lay them out on the planter face (F) without glue. Once you have a pattern you like, use CA glue (also known as super glue) to secure the dimensional pieces to the planter box faces (F). This will avoid nail holes, filler and sanding of these pieces.

7 BUILD THE SHADOW BOX

Join the shadow box top and bottom (G) with the sides (H) using wood glue and 18-gauge brad nails with at least four nails joining each corner. Ensure that it is constructed square by measuring corner to corner diagonally (see Photo 7, page 24).



5



6



6

DO FOOD EXPIRATION DATES REALLY MATTER?

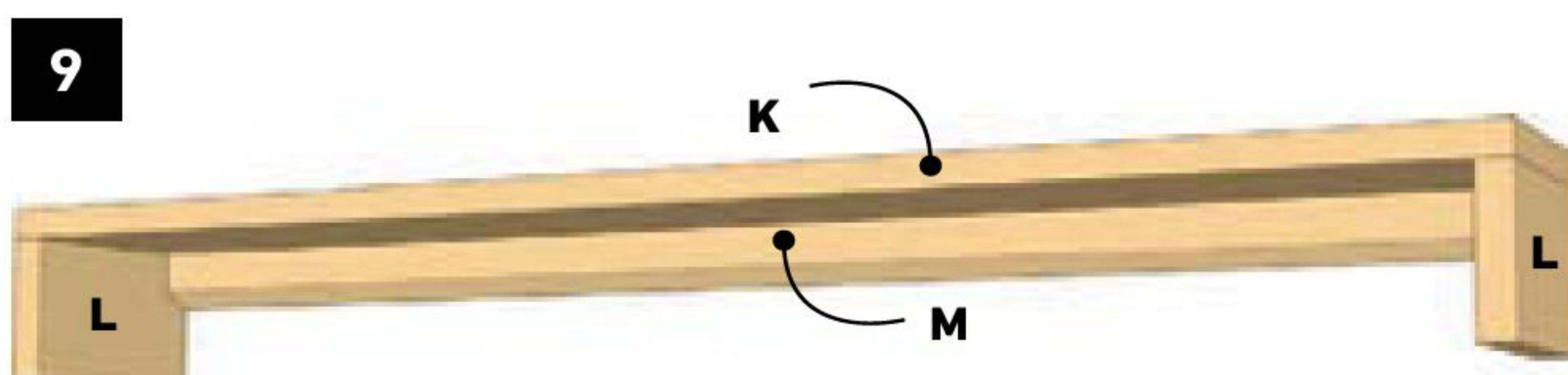
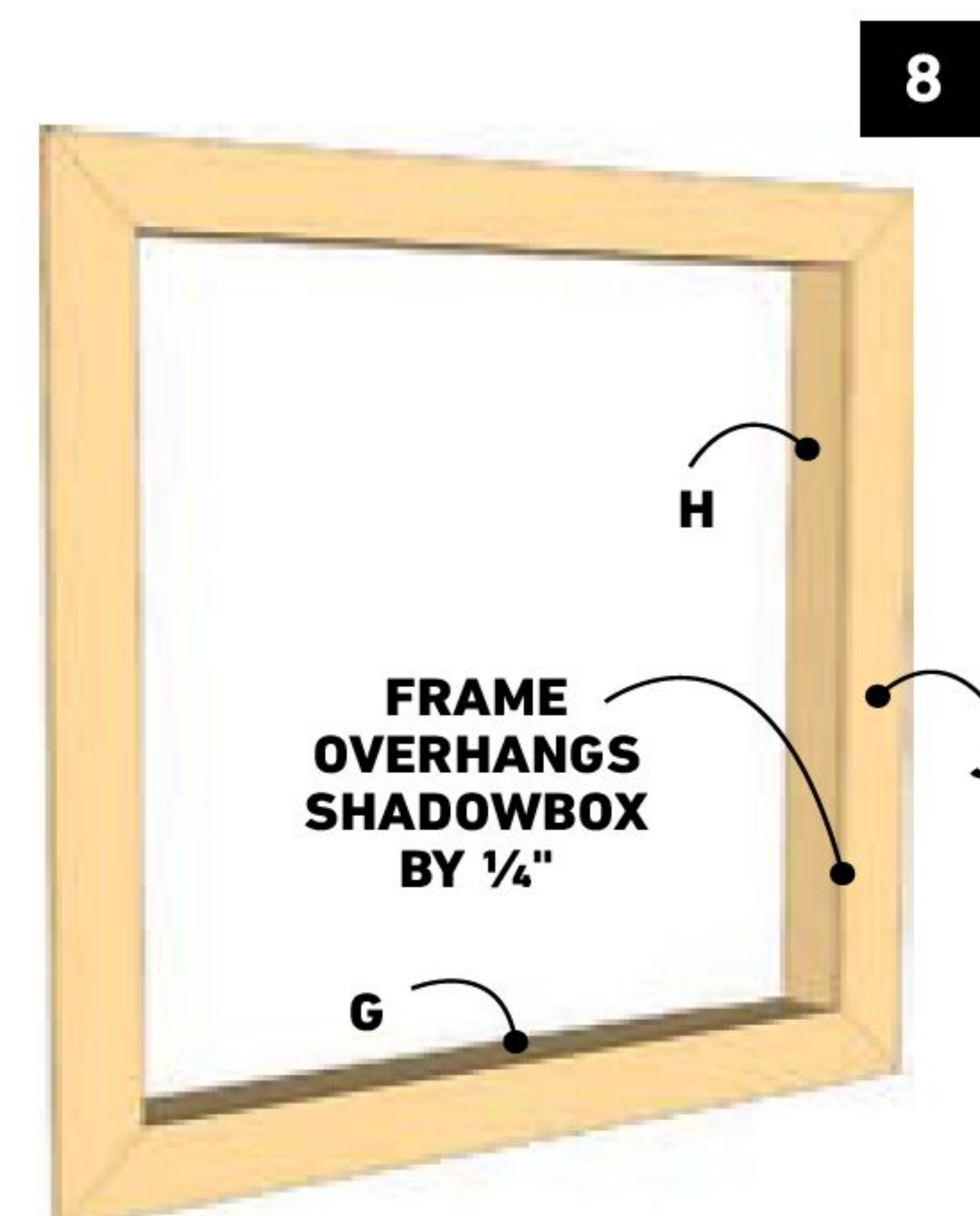


We spoil the myths around product “Use By” dates to help you save more time, money & food!

Check out this informative article from our sister brand, Taste of Home, that uncovers the truth about expiration dates and what they really mean. You’ll learn if your “overdue” items are really ready to toss or not exactly a total loss...yet!



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8 BUILD AND ATTACH THE FRONT FRAME
Nail and glue the corners of the four mitered frame pieces (J) to create a front picture frame with flat 45-degree angles. The frame must be square, so cut test miters and measure corner to corner diagonally when assembling.

Lay the completed square front frame on the completed shadow box. Use wood glue and 18-gauge brad nails to join the frame pieces (J) to the shadow box, nailing at least every 9 in. Use the square front frame as a guide

to ensure that there is a 1/4-in. overhang over the shadow box, all the way around the frame.

9 BUILD AND ATTACH THE CLEAT SUPPORT BOX
Using brad nails, glue and screws, build a three-sided box out of the cleat support top (K) and cleat support sides (L). Attach a frame cleat (M) flush to the back edge of the cleat support top (K) and sides (L).

Center the cleat support box on the frame. Use wood glue and pocket-hole screws to attach the cleat

support box to the backside of the shadow box top (G) and top frame piece (J).

10 FILL, PAINT, STAIN AND POLYURETHANE
Fill all nail holes on the assembled boxes and frame with natural-colored/maple wood filler. Let it dry, sand it back and touch up the stain.

Instead of using fine-grit sandpaper, which may remove some of the stain, wet a cotton rag and wipe away the filler. The moisture will make the filler pliable again so you can feather it back for a smooth, seamless surface.

Paint the wall cleats (E) the same color as the wall so they blend in.

Once the stain has dried, seal the wood with two coats of polyurethane, allowing for the recommended drying time between coats. Before applying the second coat, lightly sand back the raised grain with 320-grit sandpaper. Just knock down the grain—don't sand hard enough to

reach the stain layers and ruin your finish.

11 HANG THE OUTER FRAME
Determine the height at which you'd like to hang the living wall frame, then use a stud finder to mark the studs and the overall unit's centerline at that location.

Center the second frame cleat (M) on the center line with the bottom of the cleat level and 3 3/8 in. lower than the desired height. Secure the frame cleat into at least two studs.

Hang the frame so that the frame cleat (M) inside the cleat support box marries to the frame cleat on the wall.

Check that the unit is level. If the cleat is hung level, the frame should end up level.

Once the frame is level and where you'd like it, crawl underneath the unit and secure the shadow box bottom (G) to the marked studs on the wall in at least two locations using 2-in. angle brackets to permanently lock the living wall frame in place.

12 INSTALL THE BOXES

Start by placing the lowest row of boxes. To leave a $\frac{1}{2}$ -in. gap between the frame and boxes, sit the lower boxes on a $\frac{3}{4}$ -in. piece of wood to serve as a spacer. (The shadow box is recessed $\frac{1}{4}$ in., so placing the boxes on a $\frac{3}{4}$ -in. spacer will leave a $\frac{1}{2}$ -in. reveal.)

Slide the wall cleat (E) into position inside its box and screw it to the wall hitting at least one stud. If you can't find a stud where your cleat needs to be positioned, mark its placement, predrill and install drywall anchors to hold it in place. Repeat for all boxes in this row.

Rest the middle row of boxes on top of the bottom row so they are flush with each other along the top, all the way across. Continue to leave a $\frac{1}{2}$ -in. gap between the boxes and the frame. Repeat the same method for installing the wall cleats (E) for each box in the second row. Follow the same process for the top row.

13 INSTALL THE WATERING SYSTEM

After populating the living wall with plants, I followed the manufacturer's recommendations and installed the Kollea Reliable Automatic Watering System, which I chose for its programmable watering schedule feature and remote control.

This system requires downward water siphoning using gravity to flow to the plants. To feed

the water drip system, I created a water tank using a square plastic flowerpot, which I sat on top of the shadow box top (G), behind the top frame piece (J).

Identify which boxes will require watering to determine the path of the tube. To promote water flow, ensure the tube flows in a progressive downward direction. Using a $\frac{3}{8}$ -in. drill bit, drill holes from planter to planter, starting at the top near the water tank and working your way down. Connect the drip system tube from top to bottom using the included three-way or two-way plastic couplers. Test the water flow before adding your plants.

14 INSTALL THE ROPE LIGHT

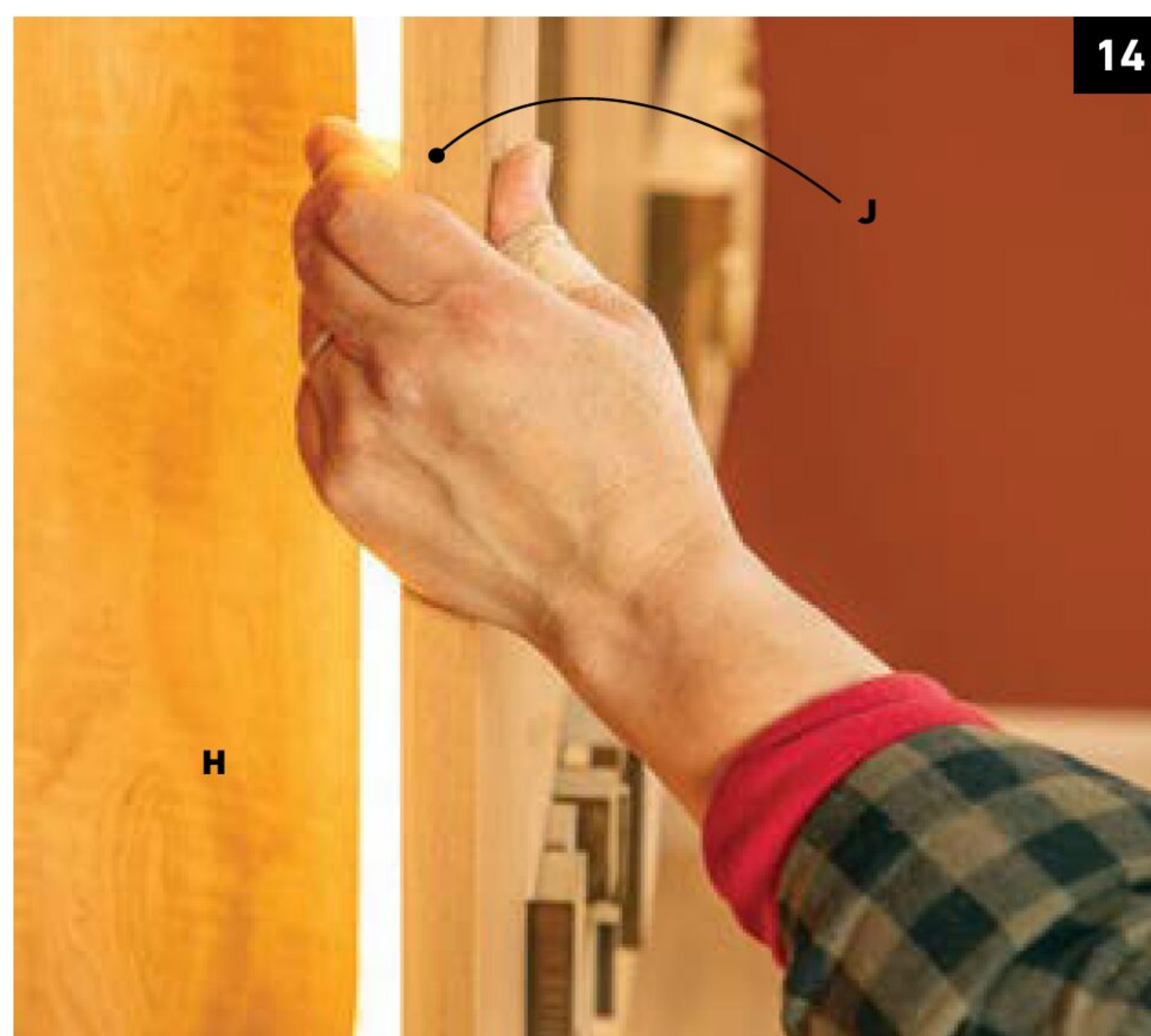
Based on how long your rope light is, determine where you want the light to start and end. This will be determined in part by the outlet you are using to power it. A battery-powered light offers more flexibility, but you'll have to determine how and where to mount the battery pack.

Secure the rope light to the back of the frame pieces (J) with the included plastic clips and double-sided tape. ●



Video Online

Scan the QR code to watch a video of this project.





INSTALL AN IMMERSIVE **Home Theater** **System**

Learn how to elevate game day
and movie night in any space

BY SAMUEL ROSENMAYER

Modern surround sound systems pack a big punch with small speakers. But to get the most out of them, you need to set them up correctly for your space. For a pro's insight on home theater systems, I consulted Amanda Wildman, integrator, electrical apprentice and co-owner of the technology installation company TruMedia. Wildman, who also sits on the board of the Custom Electronic Design and Installation Association, maintains that home surround sound should create

an incredible audiovisual experience that elevates your sense of reality as you watch your favorite films.

Wildman encourages anyone in the market for new speakers to ask: What experience am I trying to create? What are my limitations? What are the best products that will play (or integrate) together? The answer to that last question isn't always the biggest or most expensive system. Take your surroundings into account. If you live in a small apartment, a sound bar may be all you need—not a seven-speaker setup that sets you back \$1,600.

TMB STUDIO



Another key factor to be aware of is sound bouncing, which causes an unpleasant echo. Hardwood floors, windows and empty wall space can all contribute to that effect. Wildman also noted that artwork, especially metal, can sometimes cause disturbing high-frequency sound bouncing. Adding soft surfaces to a room helps absorb the sound.

For this installation, I used a 5.1-channel system that fit the budget and was suitable for the room's size and

layout. You may wish to consider a 2.1-channel system for small rooms or a 7.1-channel system for the ultimate experience in larger areas. No matter your needs, read on to learn how to get your space ready for showtime.

1 PREP AND MEASURE

To begin, move any furniture, plants, etc. away from where you plan to run the wire. I also removed any extra wires and components from the TV console to minimize confusion.

Measure the dimensions of the room and be sure to have enough speaker wire to run the room's perimeter near the baseboards. Taking the room size and furniture placement into account can also help you determine the ideal speaker setup.

Materials

- HDMI eARC cable
- Speaker stands
- Speaker wire
- Surround sound speakers and receiver

What It Takes

Time
1-3 hours

Cost
\$650-\$1,000

Skill Level
Beginner

Tools

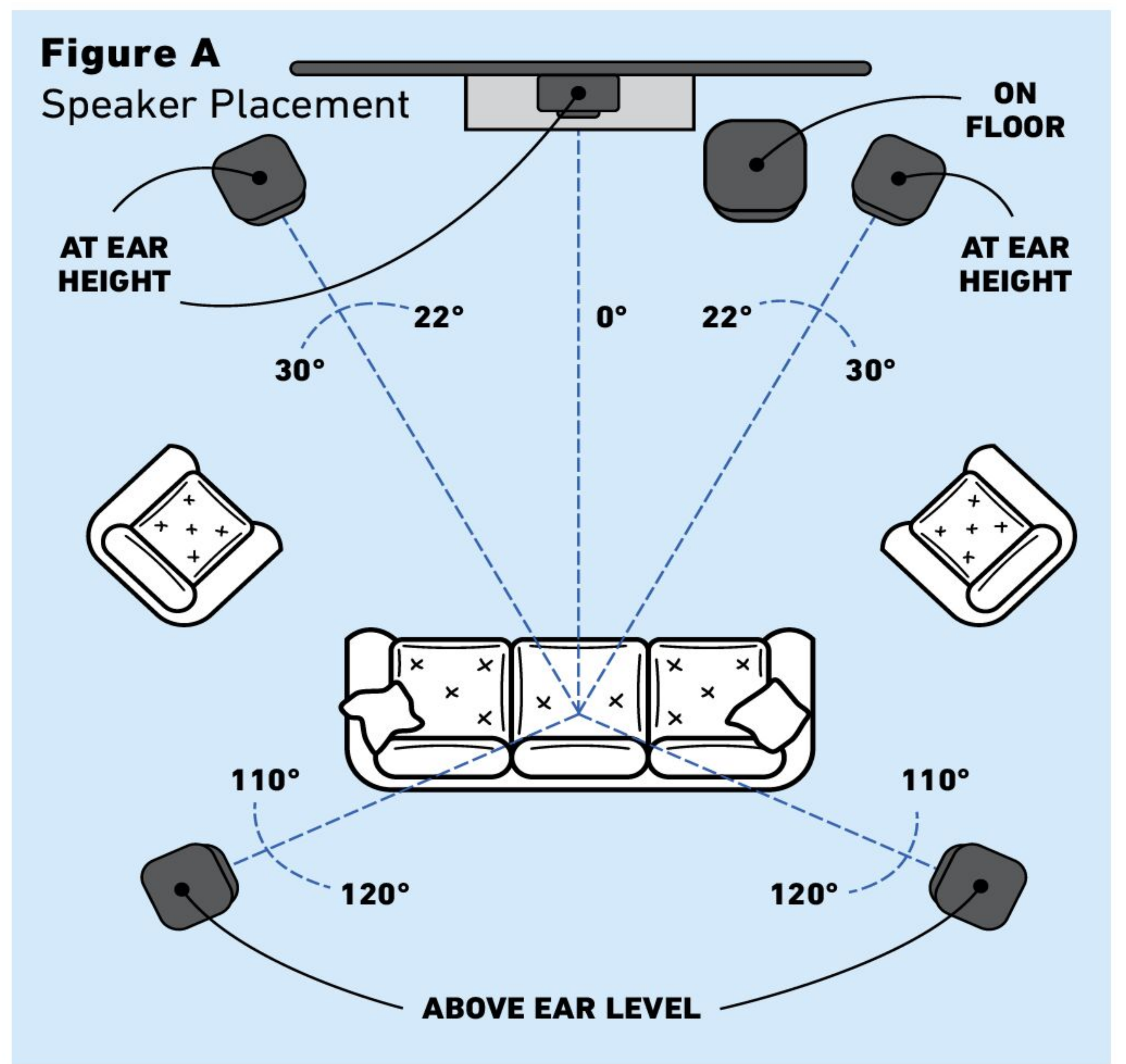
- Needle-nose pliers
- Tape measure
- Wire crimper

2 PLACE THE FRONT SPEAKERS
Place the center front speaker in the middle of the TV console, then place the front left and right speakers on each side of the center speaker. Direct the sound toward the center of the seating area by slightly angling the left and right speakers.

TIP: Front speakers sound best at ear level. To achieve this, you may need to use speaker stands or mount the

speakers onto the wall. This homeowner's TV console was at ear level from the seating area.

3 POSITION THE REAR SPEAKERS
Place the rear surround speakers behind the seating area or behind and slightly outside it, ideally creating a 110-to-120-degree angle between the TV, the center of the seating area and each speaker. The speakers should be above ear level and



angled toward the center of the seating area.

This homeowner did not want speakers mounted to the wall, so I used speaker stands that could hide wires inside the stand, keeping them out of view.

4 PLACE THE SUBWOOFER
Place the subwoofer on

the floor on either the right or left side of the TV console, facing toward the center of the seating area. Be sure to take the room's travel paths into account.

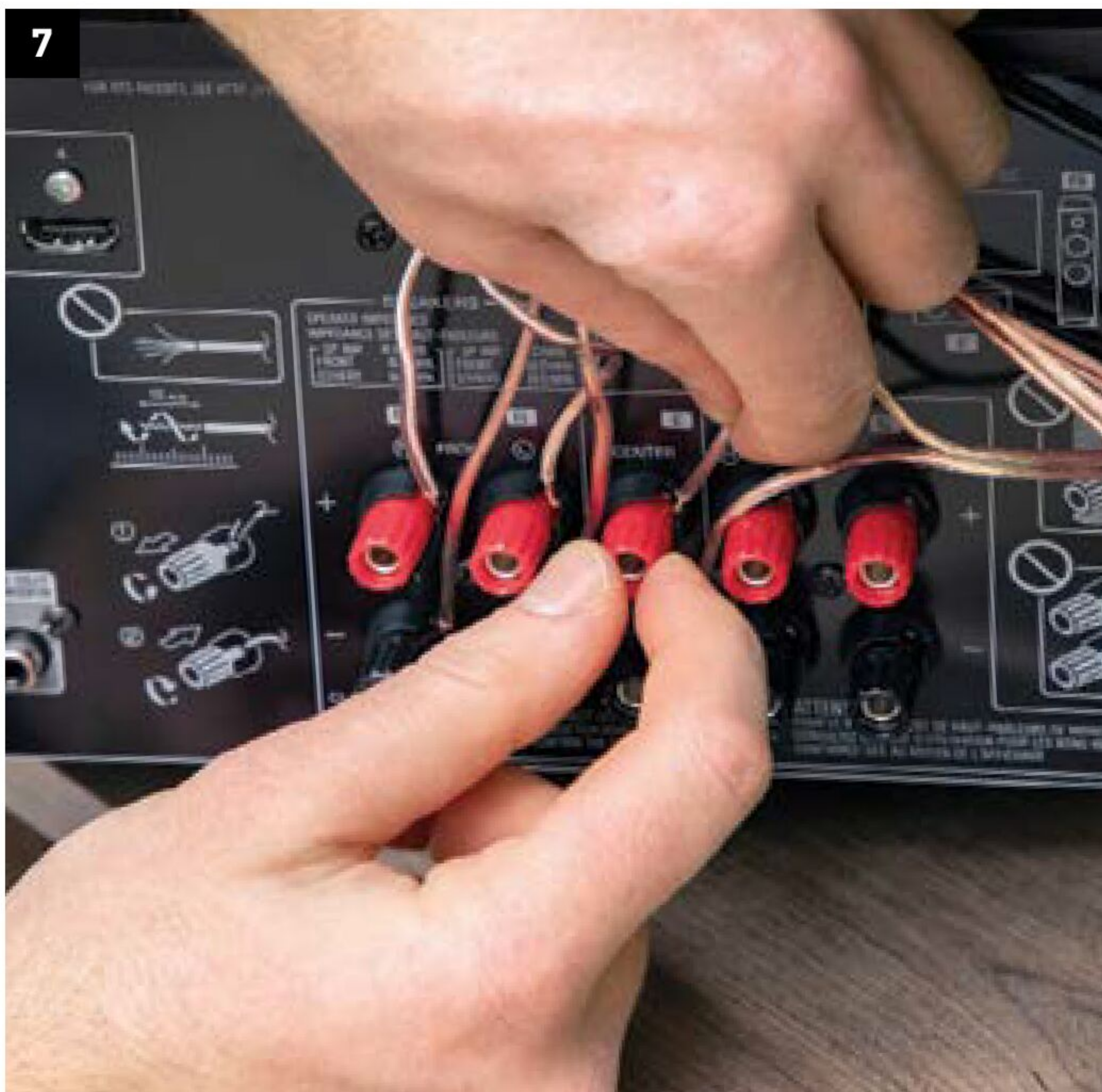
5 CONNECT THE SPEAKER WIRES TO THE SPEAKERS
Determine the length of wire needed for each

speaker to reach the receiver, then cut the wire with a crimper. Again using the crimper, remove about $\frac{1}{4}$ in. of the wire insulation on the ends. Twist the exposed wire strands in the opposite direction and attach them to the speakers.

TIP: Speaker wire indicators, such as

colored red/black wires or labeled wires, help ensure that the speaker terminal and the receiver terminals match up with the correct wires.

6 HIDE THE SPEAKER WIRES (OPTIONAL)
For a clean look, hide the speaker wire by running the wire under



the carpet or along the baseboards. I was able to push the wire under the baseboards and out of sight using a pair of needle-nose pliers.

7 CONNECT THE SPEAKER WIRES TO THE RECEIVER

Just as you did in Step 5, remove $\frac{1}{4}$ in. of the wire insulation using the crimper and connect the wires to the receiver.

Most receivers (like the one I set up) have the wire inputs labeled for each speaker to avoid any confusion. Connect the speaker wires to the appropriate inputs by placing the wire into the terminal and turning the terminal knob clockwise until tight but not too tight.

If the receiver uses a screw terminal connection, make a shepherd's loop in the end of the speaker wire to connect it to the receiver. Not

all receivers need this—the receiver I installed required the exposed wire strands to be twisted before connecting to the screw terminal.

8 CONNECT THE RECEIVER TO THE TV

Using an HDMI cable, connect the receiver to the TV's HDMI port. **TIP:** I recommend using an eARC (Enhanced Audio Return Channel) HDMI cable because it transmits the highest sound quality.

9 ADJUST THE TV OUTPUT AND TEST THE SURROUND SOUND

Access the audio settings on your TV using the menu on your remote and select the audio output option that corresponds to the connection between your TV and the receiver.

Next, test the sound system. Most receivers have an automatic set-up feature that uses a



connected microphone to measure the ambient sound levels and optimize the speaker balance.

TIP: Search for surround sound test videos on platforms like YouTube to evaluate the audio performance of your system. These videos are specifically designed to test the

capabilities of surround sound systems. ●



Video Online

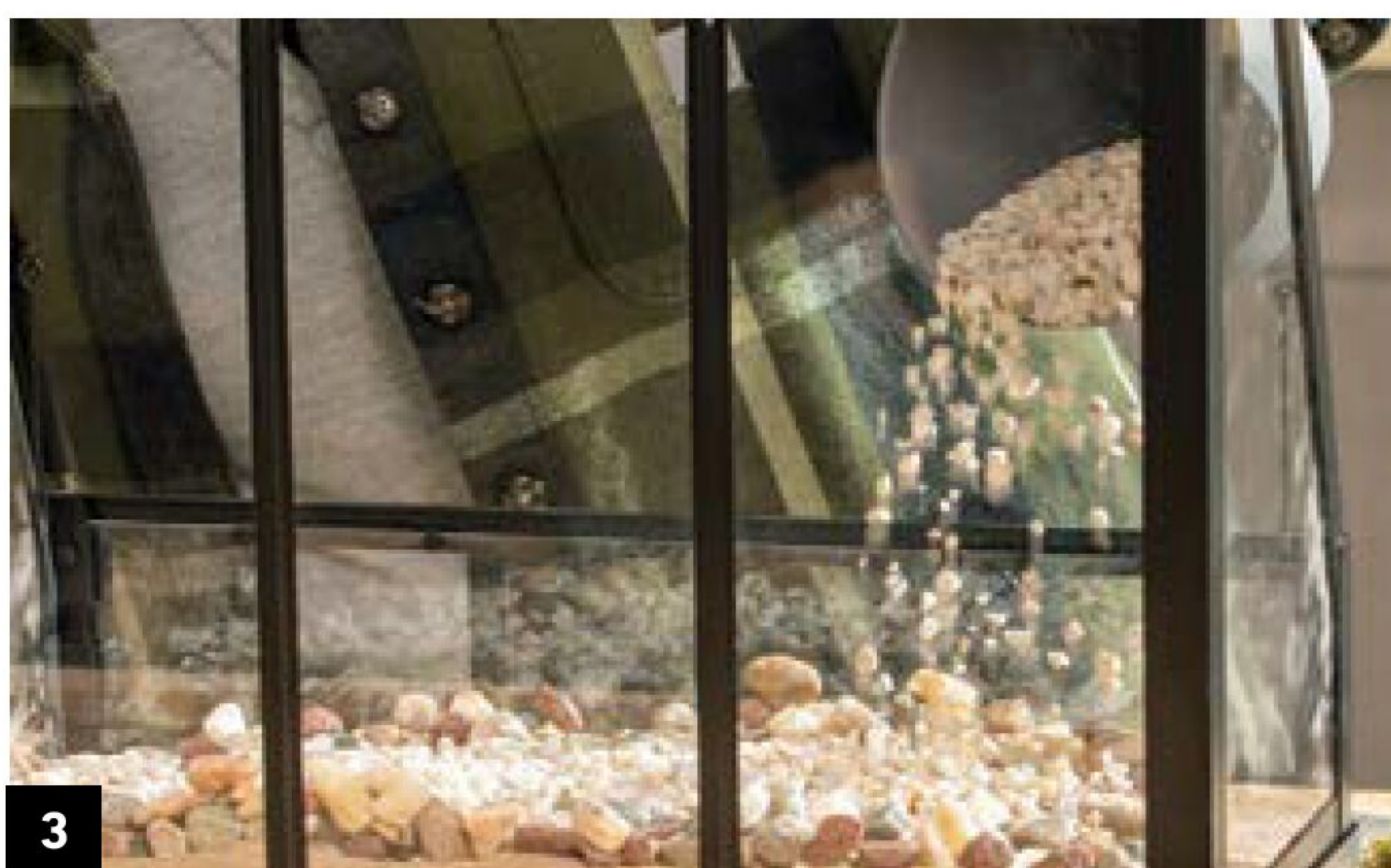
Scan the code to watch a video of this installation.

Ready, Set, Grow

Bring the outdoors in with DIY projects that keep your favorite plants close at hand

BY CARMEN DE LA PAZ





Closed-Lid Terrarium

With the right foundations, a terrarium can become a lush miniature garden for moisture-loving plants

Making a terrarium is about as close as you can get to a Zen DIY project. Once you have gathered the proper materials and squared away your plant selections, it's as simple as layering it all together and watching your mini-ecosystem thrive. Here, I'll walk you through my fool-proof process and cover all the required elements for good filtration, healthy soil, strong root growth, and resistance against fungus and disease.

1 CHOOSE A PROPER CONTAINER Choose a lidded container that will capture moisture and hold enough soil and drainage layers to support the growth of your plants.

NOTE: Due to the high moisture level, a closed-lid terrarium has a higher risk for root rot, fungus and disease, so drainage is extremely important.

2 SELECT YOUR PLANTS Choose plants that will thrive in the high-moisture environment of a closed terrarium—consult someone at your local plant nursery for recommendations. To give your minigarden plenty of visual interest, select plants that are different in height, leaf shape and color.

NOTE: Succulents and cactuses are better suited for an open-style terrarium and will require different growing conditions. For more information, see page 33.

3 START WITH A DRAINING BASE LAYER Lay a ½-in. bed of sand into the container. On top of that, add 1 in. of small to medium pebbles or small stones. These base layers will pull excess water away from the roots of the plants, helping to prevent decay and disease. If desired, you can add a thicker layer of either material.

4 LAY IN LANDSCAPE FABRIC AND ADD ACTIVATED CHARCOAL Activated charcoal will help filter toxins and help keep your plants healthy from disease. To prevent the charcoal from seeping down and mixing into the stones and sand, cut a piece of landscape fabric as close to



the shape of your vessel as possible and lay it over the pebbles, then add the charcoal over the weed barrier.

5 ADD THE SPHAGNUM PEAT MOSS

Lay in ½ to 1 in. of sphagnum peat moss. This layer will absorb water and hold moisture

Tools

Scissors
Small garden shovel
Water mister
Watering can

Materials

Activated charcoal
Landscape fabric
Lidded terrarium
Living moss
Plants
Potting soil
Sand
Small/medium pebbles
Small stones
Sphagnum peat moss

around the roots of your plants, extending the time between watering sessions.

6 ADD THE POTTING SOIL
Add 2 to 3 in. of potting soil. This will be your terrarium's thickest layer, where the plants will grow their roots. If desired, vary the height of the soil layer across your terrarium. This will create more visual interest and allow you to emphasize the height differences among your plants. If you are planning to add any decorative elements, this is the time to think about placement and take advantage of the undulations you've made in the soil. High points are good areas to place plants that may need less moisture—water will drain down and dry out faster.

7 PLACE AND PLANT
Once you've determined your preferred plant placement, add your plants to the terrarium.

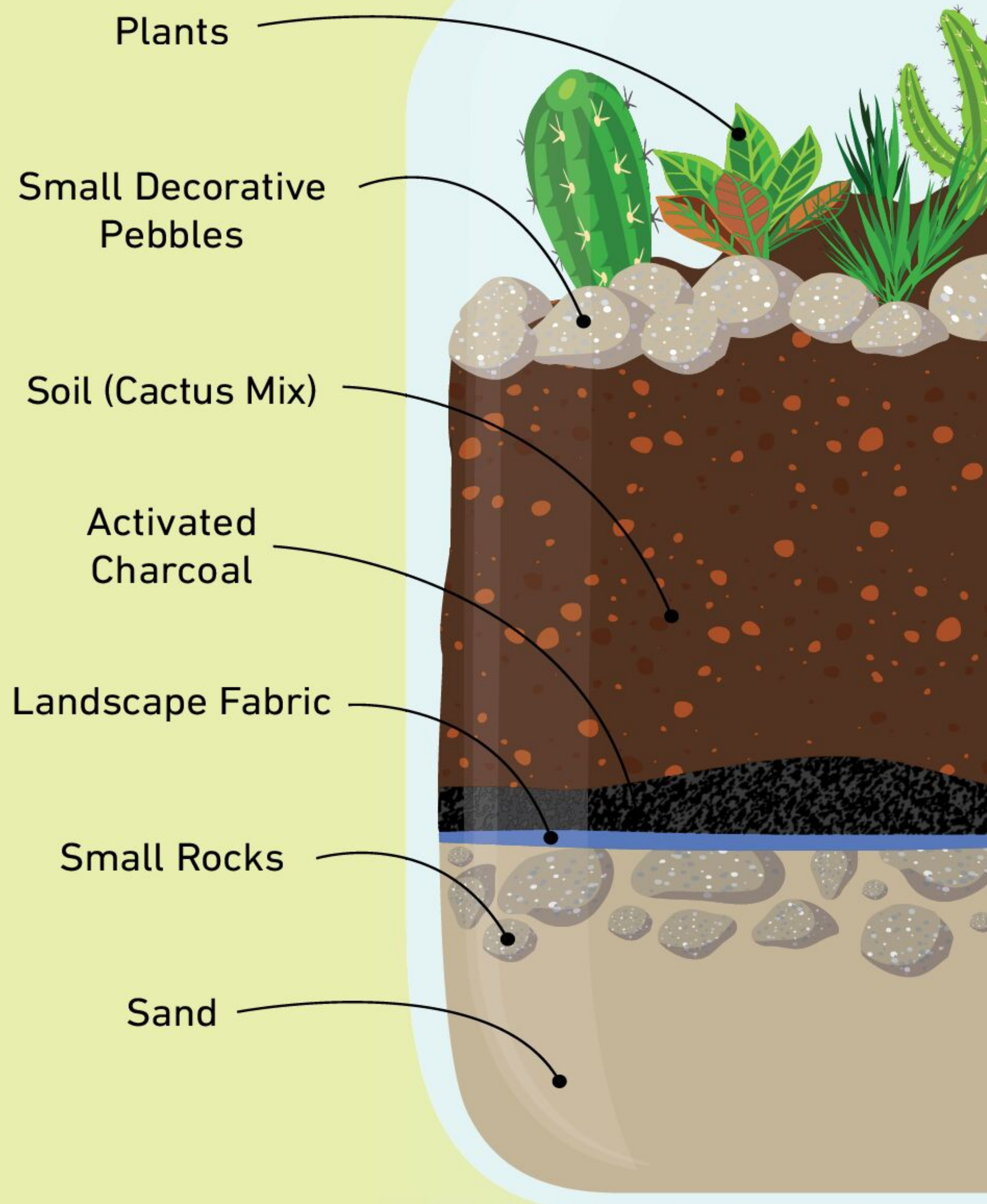
NOTE: Plants that thrive in a moist environment tend to grow faster, so be sure to leave them ample space to grow in.

8 ADD PEBBLES AND LIVING MOSS
Add small pebbles and living moss around the base of your plants—this will add texture and help prevent erosion by holding your layers in place as you water.

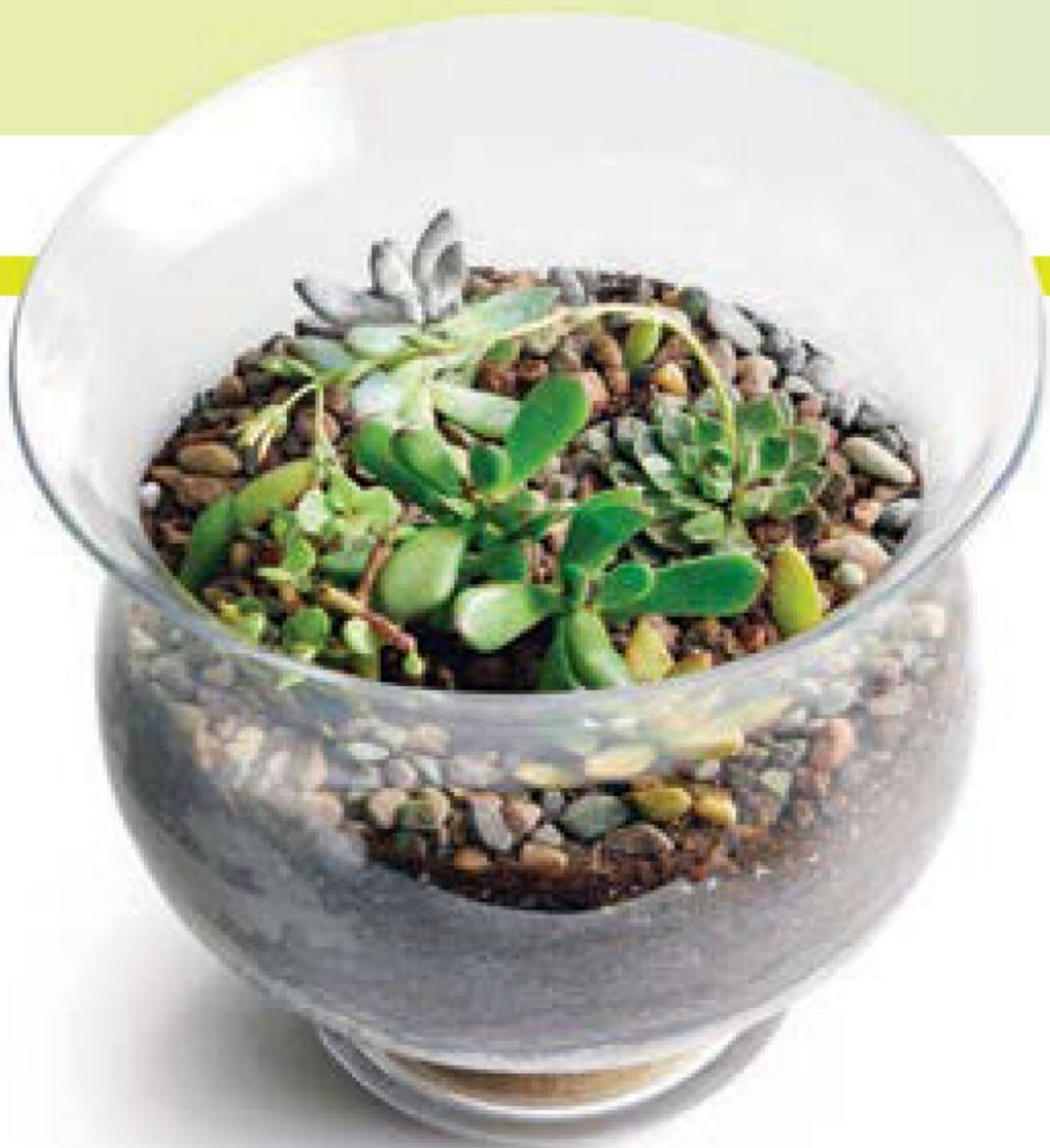
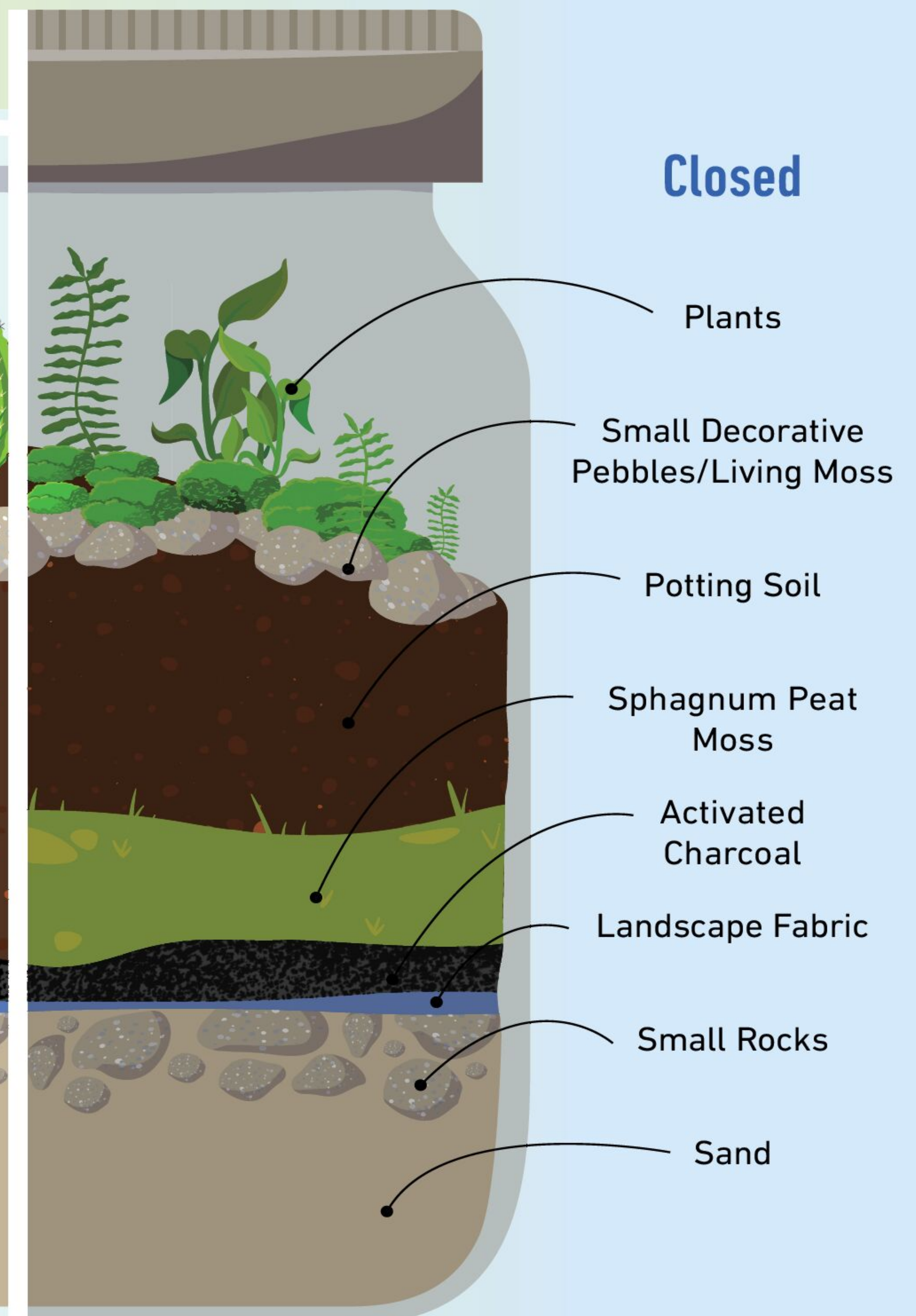
9 MAINTAIN YOUR TERRARIUM
Water the plants in your terrarium every two weeks. You can also mist them with a light spray once a week. You want moisture in the vessel, but not so much that the roots decay. Be vigilant: Observe the environment, and water as you see fit. Once a month, open the lid of your terrarium for 20-30 minutes to create air circulation. Do not put your terrarium in direct sunlight; the glass can act as a magnifier and may burn your plants' leaves.

Terrarium Soil Layers

Open



Closed



Love Succulents?

Water-loving plants can grow happily in the moisture of a closed-lid terrarium, but other plants, such as cactuses and succulents, require an arid environment, calling for an open terrarium—and special soil layers—to truly thrive. Luckily, both terrarium styles are easy to achieve.



More Online

Scan the QR code to see a video of this project and learn more about creating an open-style terrarium.

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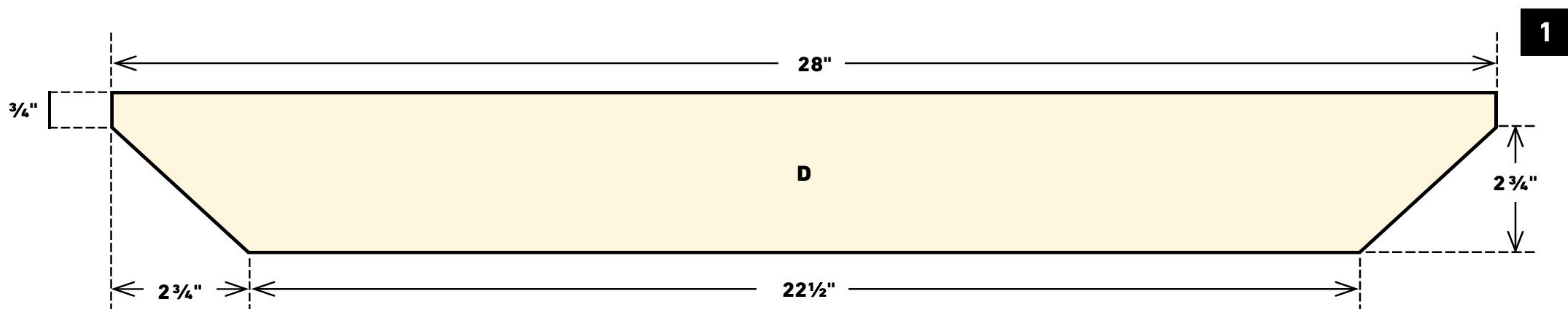
Indoor Herb Garden

Channel your inner gourmet with a stylish
and easy-to-build herb garden

This project combines two things I love: indoor plants and cooking. There is truly nothing better than creating fresh flavors in the kitchen with herbs cut just as you are about to make a dish!

As I designed this herb garden, I kept both form and function in

mind. I knew the build needed a small footprint, which meant going vertical. I also wanted the ability to adjust the height of the pots as my plants grew or I changed them out. To achieve this, I began with a wooden frame and used threaded rods along with washers and nuts to



support the weight of the potted herbs and make their height adjustable.

The full process follows. As a bonus, I've also shared how to make an organic stain to give the herb garden a worn, weathered, old-world look. Here's to wood-working, cooking and plants!

1 CUT THE WOOD PIECES
Use a miter saw to cut the wood for parts A-E. Note that the front and back top faces (D) have a miter cut on each end.

2 LAY OUT THE THREADED ROD LOCATIONS
The threaded rods will run

vertically through the whole unit, so the holes in each section must line up exactly from top to bottom.

Tools

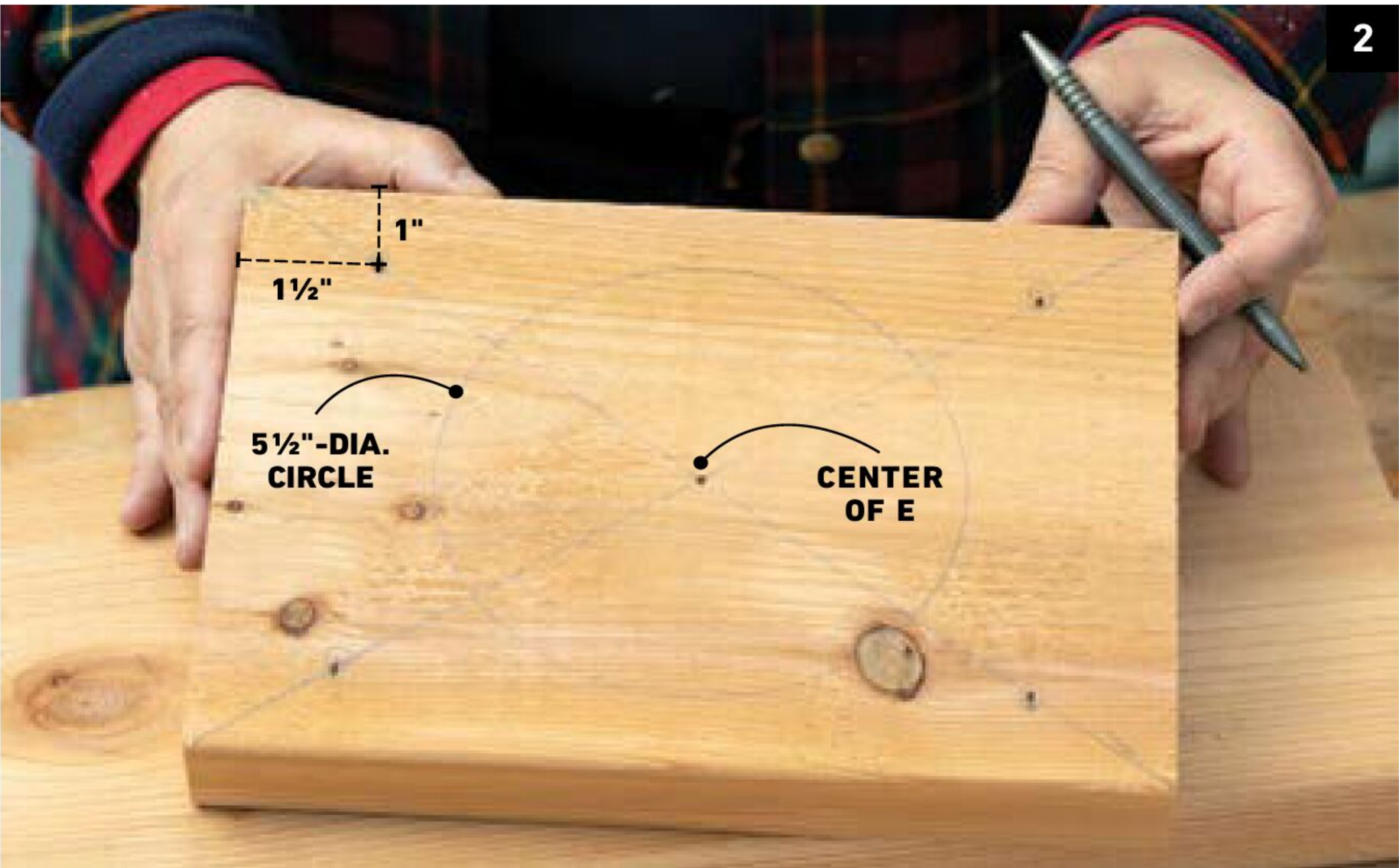
- 1 1/8" Forstner bit
- 18-gauge nail gun
- Angle grinder with thin cut-off wheel
- Assorted drill bits
- Caulk gun
- Clamps
- Compass
- Countersink bit
- Drill press
- Drill/driver
- File
- Jigsaw
- Miter saw
- Speed square
- Staining supplies
- Tape measure
- Torpedo level
- Trim router with round-over bit

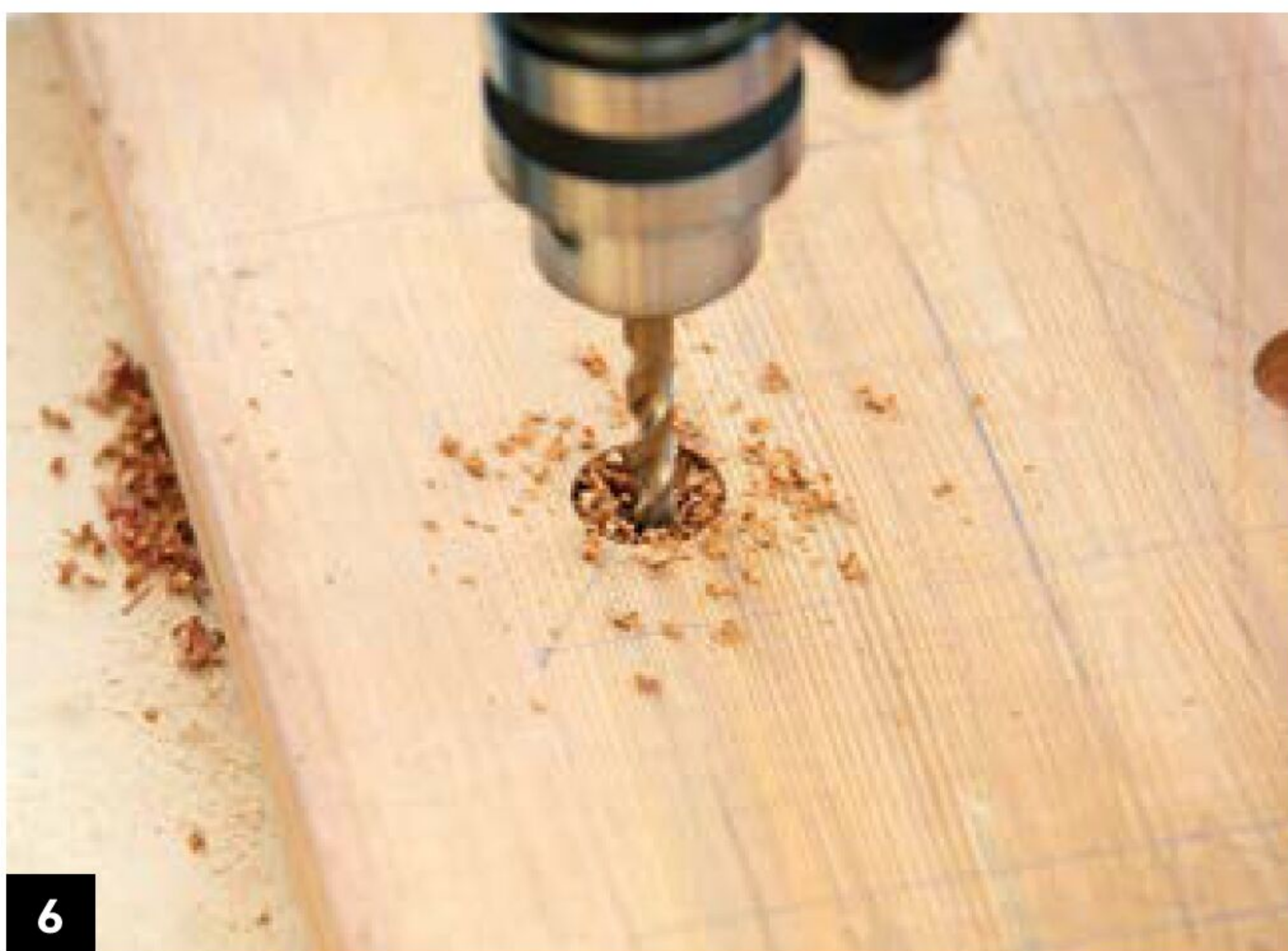
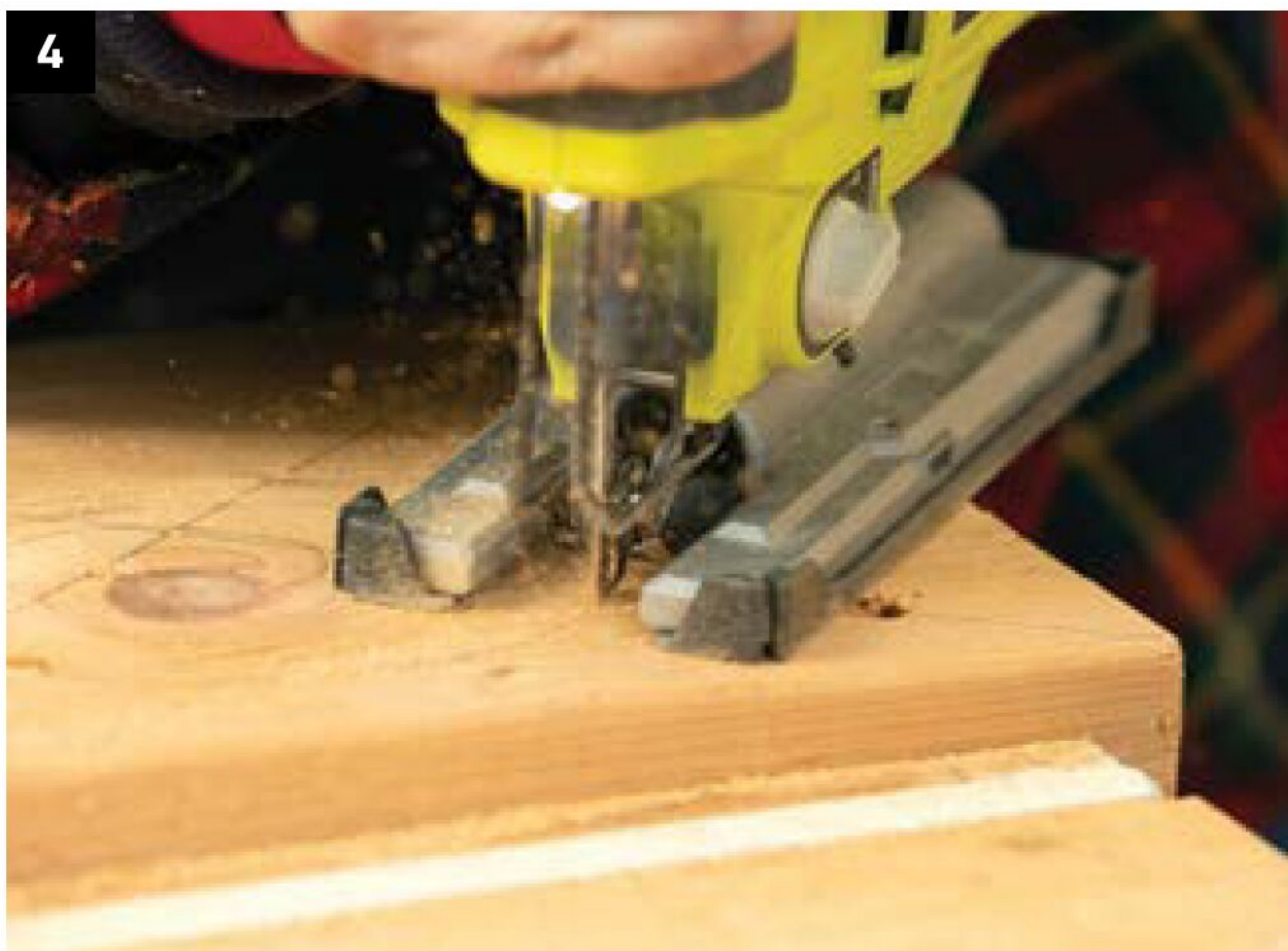
Materials

Item	Qty.
3/8" washers and nuts	
1x4 x 8'	1
1x6 x 8'	1
1 1/2" 18-gauge brad nails	
2x8 x 8'	1
2x12 x 3'	1
3/8" x 72" threaded rods	2
3" deck screws	
6" terracotta pots	4
Metal catch tray	
Sealer (optional)	
Silicone caulk	
Small stones	
Steel wool pads (optional)	2-3
Vinegar (optional)	1 qt.

Cuts

Key	Qty.	Dimensions	Part
A	1	1 1/2" x 11 1/4" x 26"	Base
B	2	3/4" x 5 1/2" x 48"	Sides
C	1	1 1/2" x 7 1/4" x 22 1/2"	Top cap
D	2	3/4" x 3 1/2" x 28"	Front/back top faces
E	4	1 1/2" x 7 1/4" x 10"	Pot supports





Start by drawing a 5½-in.-dia. circle centered on each of the four pot support boards (D). Standard 6-in. plant pots will stand a bit proud with the 5½-in. hole. Next, draw marks for the four threaded rod holes 1½ in. from the cut edges of the board and 1 in. from the sides. Transfer this layout for the rod holes to the center of the base (A) and top cap (C) so that all the rod holes align from top to bottom.

3 DRILL THE THREADED ROD HOLES IN THE POT SUPPORTS
At the drill press, use a sacrificial piece of wood under your pot supports (E) to avoid tearing out on the underside of the wood and prevent damaging the bed of your drill press. Drill the four holes for the threaded rods

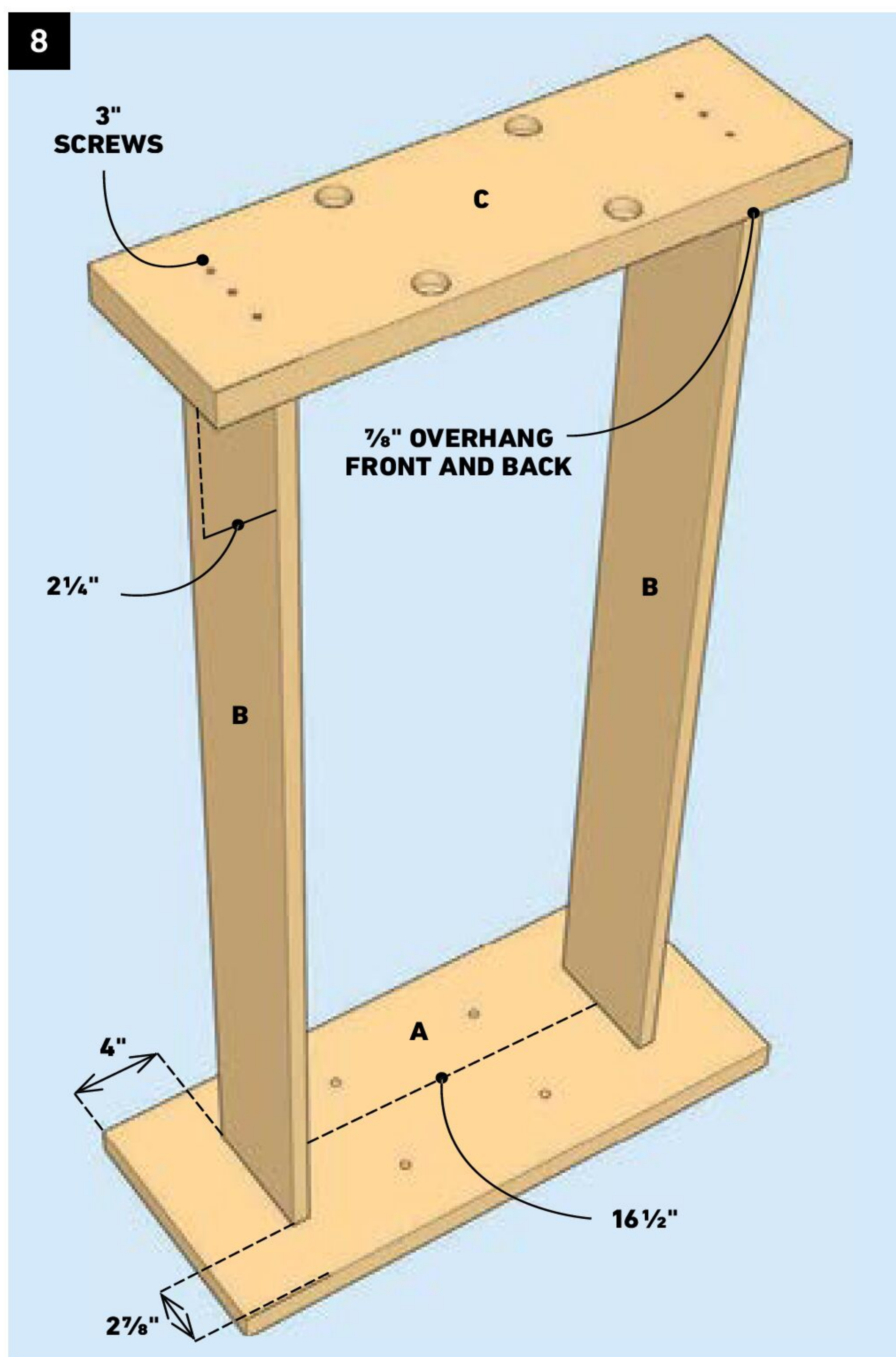
using a ½-in. drill bit. A slightly bigger hole will make it easy to feed the ⅜-in. rods through the pot supports (E). Secure the wood with clamps to prevent the wood from being pulled out of alignment.

NOTE: For alignment purposes, avoid drilling these holes with a handheld drill.

4 CUT THE CIRCLES FOR THE POT SUPPORTS
Use a jigsaw with a clean-cut blade to cut the center circle for the pots in the pot supports (E). For easier access to the inner circle, drill a ⅜-in. hole inside the circle. Introduce the jigsaw blade through the ⅜-in. hole and cut a clean circle for the pot to rest in. Be sure to secure your piece of wood with clamps or a worktable vise.

5 ROUND OVER THE EDGES OF THE POT SUPPORTS
Clean up the cut circles in the pot supports (E) with a trim router and a round-over bit with a bearing. Round over the four sides of the pot supports to soften their cut edges.

6 DRILL AND COUNTERSINK HOLES IN THE BASE AND TOP
To ensure the base sits flat on the floor and hides the nuts and washers, countersink the threaded rod holes in the base (A) and top cap (C). To do this, drill your marked threaded rod holes using a 1⅝-in. Forstner bit and stop when you've gone ½-in. deep. Then drill through the remaining thickness of wood with the ½-in. drill bit like on the pot supports (E). Use the center punch of the Forstner bit to align the drill bit.



NOTE: The 1 1/8-in. size is large enough for a wrench to fit in and tighten the nut in place easily.

7 DRILL HOLES IN THE CATCH TRAY

Transfer the arrangement of the four threaded rod holes so that they are centered on the metal tray. Drill these holes using a 1/2-in. drill bit. File back the edges of the holes in the metal to remove sharp or raised edges.

8 BUILD THE FRAME

Attach the sides (B) to the base (A) so that they are centered from front to back (set in approximately 2 7/8 in.) and 4 in. in from the outer edge of the base (A). Secure them with three predrilled and countersunk 3-in. screws.

Attach the sides (B) to the top cap (C) in the same manner,

leaving a 2 1/4-in. overhang on each side and a 7/8-in. overhang in the front and back.

Ensure the threaded rod holes align from top to bottom before proceeding.

9 MAKE THE STAIN (OPTIONAL)

To make an organic stain that will react with the tannins in the wood, put two or three pads of steel wool to soak in a quart of vinegar. Cover tightly and let sit overnight. The vinegar will break down the steel wool to create the stain. After 24 hours, strain the vinegar before you apply it to the wood to separate any small particles left of the steel wool.

10 APPLY THE STAIN

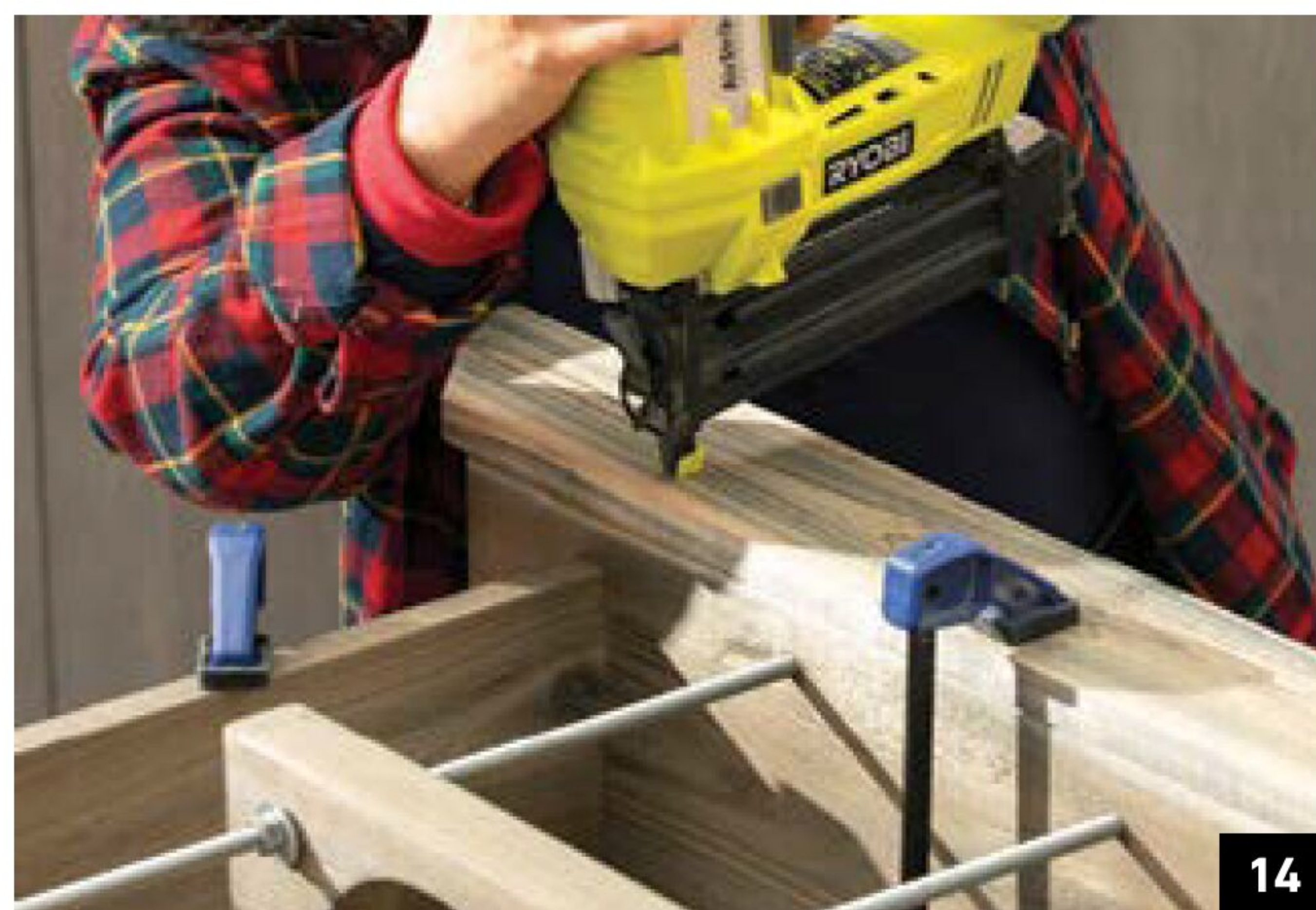
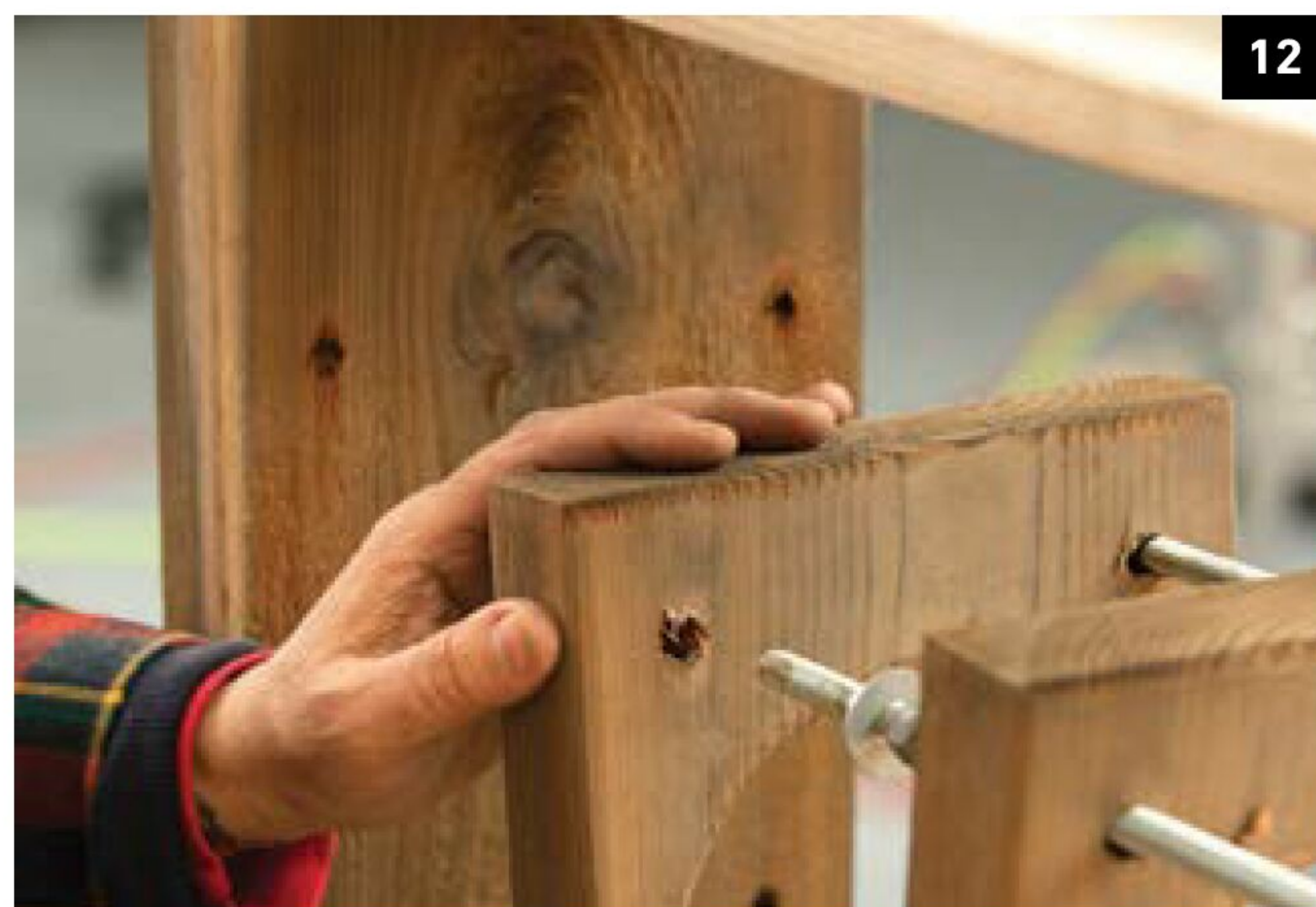
Apply your organic stain with a brush before you install

the front and back top faces (D) and the plant supports (E) with threaded rods. Apply generously and allow it to seep into the wood.

The more tannins in the wood, the darker it will get. Redwood and red oak will create the darkest reaction with this application. Different wood species will elicit different shades of brown. Do a test on a smaller piece of wood so you know what the result will be. Once the organic stain has dried, you can apply a sealer if desired.

11 CUT THE THREADED ROD

Place a nut about 1 in. below the cut line on the threaded rod to preserve the threads where you are cutting the rod. Once you make the cut, gently twist the nut over the cut end to realign any damaged threads.



It is best to do this right after the cut, while the rod is still hot and the metal threads are more pliable.

Using an angle grinder and a thin cut-off wheel, cut the threaded rod to 50% in. This length will allow the nut to grab onto the rod on both ends and prevent it from protruding beyond the surface of the wood.

NOTE: For safety, when using an angle grinder, use a full-face shield, do not remove the safety guard, be aware of where the sparks will fly and use both hands at all times.

12 ASSEMBLE THE HERB GARDEN

Thread one rod at a time by placing a washer and nut at the bottom and threading it through the base (A), metal tray and each pot support (E). Place a washer and nut under each pot

support (E) to serve as a stop. Don't worry about the exact placement of the pot supports. They will be adjusted when the potted herbs are put in place.

13 SEAL THE METAL TRAY Apply a generous bead of silicone caulk in the metal tray along the holes where the rods come up. You want to make sure it is watertight so there are no leaks when watering your plants. After the silicone has fully dried, line the metal catch tray with stones for a decorative touch.

14 ATTACH THE FACES Attach the front and back top faces (D) to the top cap (C) using a couple of small dabs of the silicone caulk you used in Step 13 and 1 ½-in. brad nails. Pure silicone caulk is a surprisingly strong and flexible

adhesive that is great for joining finished materials together.

15 PLANT HERBS Adjust the height of the pot supports according to the size of each plant. Use a torpedo level to make sure each support is level. Place a layer of weed barrier at the bottom of each pot to prevent dirt from falling out when you water your plants, then pot herbs that will thrive in the location you plan to keep your project in. As your plants grow, you can adjust the height of each pot support (E). ●



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A modern bathroom interior featuring a white vanity with two black faucets and a glass-enclosed shower area. The background shows a white wall with a black showerhead and a striped shower mat. The overall aesthetic is clean and contemporary.

ULTIMATE GUIDE TO **Bathroom Tech**

We've come a long way since the first flush toilet—and bathroom functionality becomes smarter every day. Discover what upgrades are right for you.

BY ALLY CHILDRESS

Why Tackle Tech?

The benefits of smart additions to bathrooms are about more than just convenience

Nearly everything in your bathroom can be improved by tech. Smart lighting, heated flooring and everything in between. There's plenty of overlap too. A smart toilet offers improved functionality but also luxury and health benefits. Voice activation keeps surfaces clean and saves water. Here are the many facets of bathroom tech.



BWE Touchless Bathroom Sink Faucet

Function

The best smart tech makes life easier. It enhances the things you expect to work, day in and day out. We're talking lights, toilets, faucets and thermostats. Bells and whistles are great, but practicality is job No. 1.

Functional things to look for: sensors that turn things off when not in use, hands-free controls that cut down on germs, and automated scheduling to save energy. Even bathroom windows can be smart (and what's more functional than a window?) by switching to privacy mode while you're in the loo.

Entertainment

You spend a lot of time in the bathroom, so you might as well enjoy yourself. Hop in the shower in the morning and turn on some energy-boosting tunes—the sound comes right from the showerhead. At the end of the day, take a hot bath and catch up on the latest binge-worthy show on your waterproof bathroom TV. Smart mirrors call your bestie while you get ready for a night on the town, and tell you if you'll need an umbrella.

Wellness

Looking to kick-start your health routine? Bathroom tech delivers. Smart bath mats measure your weight, body composition, posture and balance, letting you know when it's time to adjust your regimen. Install a fitness mirror and work out with a live instructor right in your bathroom. Use the touchscreen to pick a routine, and watch yourself move up the leaderboard right on the mirror.

If you're into aromatherapy, install a smart diffuser. Turn your bathroom into a calming spa experience every time you turn it on (with your voice, natch). It's a great way to wind down after a workout.

Luxury

Stepping out of a hot shower is rough, but heated towel bars and warming drawers make the cold shock a little more bearable. Install radiant in-floor heating to take the chill out of the room (we'll show you how

later). Luxurious multifunction shower systems combine rainfall showerheads, side jets, steam, light therapy and sound, for a complete spa experience.

Bidets and smart toilets are functional, but if you've ever used one, you know they're luxury items too. Heated seats, hands-free flushing and the cleanest feeling around will make you a convert.

Energy-Saving

Bathrooms are energy-intensive rooms, with nearly everything using water, electricity or both. Luckily, much of the latest bathroom tech is designed to save energy, which is great because touchless toilets and fitness mirrors aren't exactly cheap. Installing water-saving toilets, leak detection systems and smart thermostats can reduce energy and save you money.

Easy Installation

Today's tech-savvy consumers expect smooth, intuitive installation. Luckily, most smart tech available today fits that bill, though you'll probably want help with a bathtub! To control your bathroom tech, you'll need Wi-Fi and a smart assistant such as Amazon Alexa or Google Assistant. You may have to add electrical circuits, and they must be GFCI-protected to prevent electrical shock. Call a pro for help if needed.





The Heat Is On

There's nothing better than stepping out of the shower onto warm, cozy tile. Here's how to set up radiant heat.

If you can install tile, you can install in-floor radiant heat. The best time to do it is when you're remodeling, because you'll be putting in a new floor. You'll also need a dedicated GFCI-protected electrical circuit, so if you're not comfortable installing that yourself, call a licensed electrician. Some thermostats have integrated GFCI, but others don't. Make sure to follow the manufacturer's instructions, as well as all local and national electrical codes.

1 FIND ELECTRICAL POWER

Verify your power source. Some mats require 120V, others 240V. Bring an electrical circuit to your bathroom from the electrical panel, and install an electrical box and conduit for the power and thermostat connections. Do not make any connections at the main panel.

2 TEST THE MAT FOR CONTINUITY

Check the resistance of the heating cable using a multimeter, and com-

pare it to manufacturer specifications. Test the resistance multiple times throughout the installation to make sure the cable isn't damaged during the process.

3 ADD CEMENT BACKER BOARD

Prep your subfloor as you would for any tiling project. Install ½-in. cement backer board with mortar and cement board screws. Make sure the finished surface is smooth, with no protruding screw heads. Tape the seams,

and snap chalk lines for your tile layout.

4 NOTCH OUT FLOOR FOR THE WIRES

Mark the path of your heating cable power lead to the wall cavity where the conduits will bring the cable and thermostat wire to the electrical box. Chisel a trench in the cement board so the thick power lead will not interfere with the tile.

5 TEST-FIT THE MAT

Lay out the mat, with the heating cable end at the notch. Keep



A radiant-heat mat to try: the EasyHeat Warm Tiles 120V Kit

the cable 4 in. from fixtures, walls and your toilet wax ring. Temporarily fold the mat as you test-fit it around obstructions. Do not place the mat under vanities or pedestal sinks.

6 TAPE THE MAT TO THE FLOOR
Tape the mat to the floor using double-sided tape. When you come to an obstruction, cut the mat only, and flip it to go the opposite direction. Never cut the wire or overlap them. Hot-glue loose wires, keeping them 2 in. apart.

7 FISH CABLE AND THERMOSTAT WIRES
Fish the heating cable lead through one conduit, and the thermostat wire through the other. Extend the thermostat wire into the mat, following the manufacturer's instructions. Glue the heating cable into the notch.

8 SET THE TILE
Apply mortar, pushing it into the mat and floor using the flat side of a trowel. Turn the trowel over and spread with the notched side, taking care not to catch the mat or wires. Set the tile, checking continuity twice during the process. Grout the tile.

9 FINISH THE WIRING
Wire the thermostat by connecting the power lead and thermostat wires, making sure to adhere to the manufacturer's instructions. Make connections at the panel. Call a licensed electrician if you need help.



Price It Out

Scan the code to find out about radiant floor heating costs.



Spend More Time DIYing & Less Time Cleaning!

These Are the BEST Vacuum-Mop Combos That Will Cut Your Cleaning Time in Half!

Love DIY projects but not the cleanup after? Our sister brand, Reader's Digest, found the best vacuum-mop combos that will save you time, energy & hassle. See which models will sweep you off your feet!



Scan the QR Code Now to See the Clean Winner!

Look Inside a Smart Bathroom

Here are the must-have elements that take things to luxury level



Smart Diffuser

Fill your bathroom with soothing scents. Smart diffusers, such as this one from Aroma360, turn your soak in the tub into a spa day.



Smart Shades

Save energy and control comfort with Hunter Douglas's Roman Shades.



Bathroom TV

Stream your favorite shows from the comfort of your bathtub with a water-resistant TV, like this one from Ocea.

CLOCKWISE FROM LEFT: VIA AROMA360, VIA HUNTER DOUGLAS, VIA OCEATV



Mirror, Mirror on the Wall

Do you reach for your phone as soon as you wake up? Take it to the bathroom to check the overnight headlines and your calendar, or listen to music in the shower? What if you could do all that, plus make phone calls, watch a video and check your socials, with your bathroom mirror? Incredibly, you can.

A smart mirror, like the option below, from Artforma, combines the functionality of a mirror with the convenience of your phone or tablet. They can be controlled by touchscreen or voice activation. Get one that sits on your vanity or can be mounted. You can even DIY a smart mirror, and if you're handy you might want to, because smart mirrors can cost up to a few thousand dollars. If you're worried about allowing cameras and microphones in your bathroom, do your homework. Choose reputable brands, read their privacy policies and disable cameras when not in use.



Smart Bathroom Fan

Exhaust fans are utilitarian, but smart ones, like this option from Broan, sync music and lights. Turn your bathroom into a relaxing spa or a thumping disco.



Towel Warmer

Towel warmers, like this one from Giving Tree, make chilly days cozier. Tip: Use them to warm robes and clothes too.



The Moen Smart Shower Controller

Use Your Voice

Your bathroom is your sanctuary. Make it truly your own and add voice-activated technology to automate what you use most.

Toilets and Bidets

Hands-free, voice-activated toilets are a no-brainer. Approach the toilet and say “open lid.” When it’s time to flush, say “full flush” or “half flush.” No touching the seat or the handle. Heated seats and voice-activated bidet functions put you in the lap of luxury. There’s no special plumbing involved, but you’ll need a nearby electrical receptacle.

Showers

Turning the shower handle in the morning greets you with a cold blast of water right when you least want it. Wouldn’t it be great to start the shower while you’re still snuggled in bed? Just ask! Some voice-activated smart showers even stop the flow once the water gets hot, saving you an expensive utility bill. Just climb out of bed and hop in. Listen to music, turn on the steam and enjoy.

Bathtubs

Filling a tub seems easy enough, but with voice-activated bathtubs you can set the temperature and water depth for individual members of your family. Start the kids’ bath while you get dinner in the oven, without leaving the kitchen. When it’s your turn, change settings with your voice, pour a glass of wine and enjoy a hot bath before bed.

Thermostats

If you’re already using smart thermostats, the transition to voice is easy. Set up zones to control individual rooms, including your bathroom. You can even use a voice-activated thermostat for your new in-floor radiant heating.

Lighting

Nothing sets the mood like lighting. Pair your bathroom lights with Alexa or Google Assistant to control with your voice. Turn them up for daytime use, or dim them

for a relaxing evening in the tub. Today’s smart bulbs have color-changing capability too.

Windows and Shades

Voice-activated windows and window shades provide privacy when you want it, and let the light stream in when you’re craving a little sunshine. Forget to pull the blinds before getting in the tub? No problem. Voice-activated windows change from clear to frosted to save energy, and keep prying eyes out.

Faucets

Touchless faucets have been around for years, but voice activation gives you hands-free control over flow rate and temperature. Most voice-activated faucets are designed for kitchens, but you can use them in the bathroom, and bathroom-centric models won’t be far behind.

Televisions and Smart Mirrors

Waterproof TVs and smart mirrors turn your bathroom into an entertainment hub. Catch up on the news while you get ready for work, or jam to your favorite party playlist before you head out for the evening. ●

VIA MOEN; VIA WOODBRIDGE



A smart bidet by Woodbridge Bath



Clean Machines

Carpet, tile, hardwood, concrete—no floor surface is immune to the dust, dirt and debris of daily life. These editors' picks capably tackle routine cleaning and tough messes alike.

BY FAMILY HANDYMAN EDITORS

Home Vacuums



CLASSIC UPRIGHT

Shark Navigator Lift-Away Professional Upright Vacuum

\$200 • Weight: 13.7 lbs.

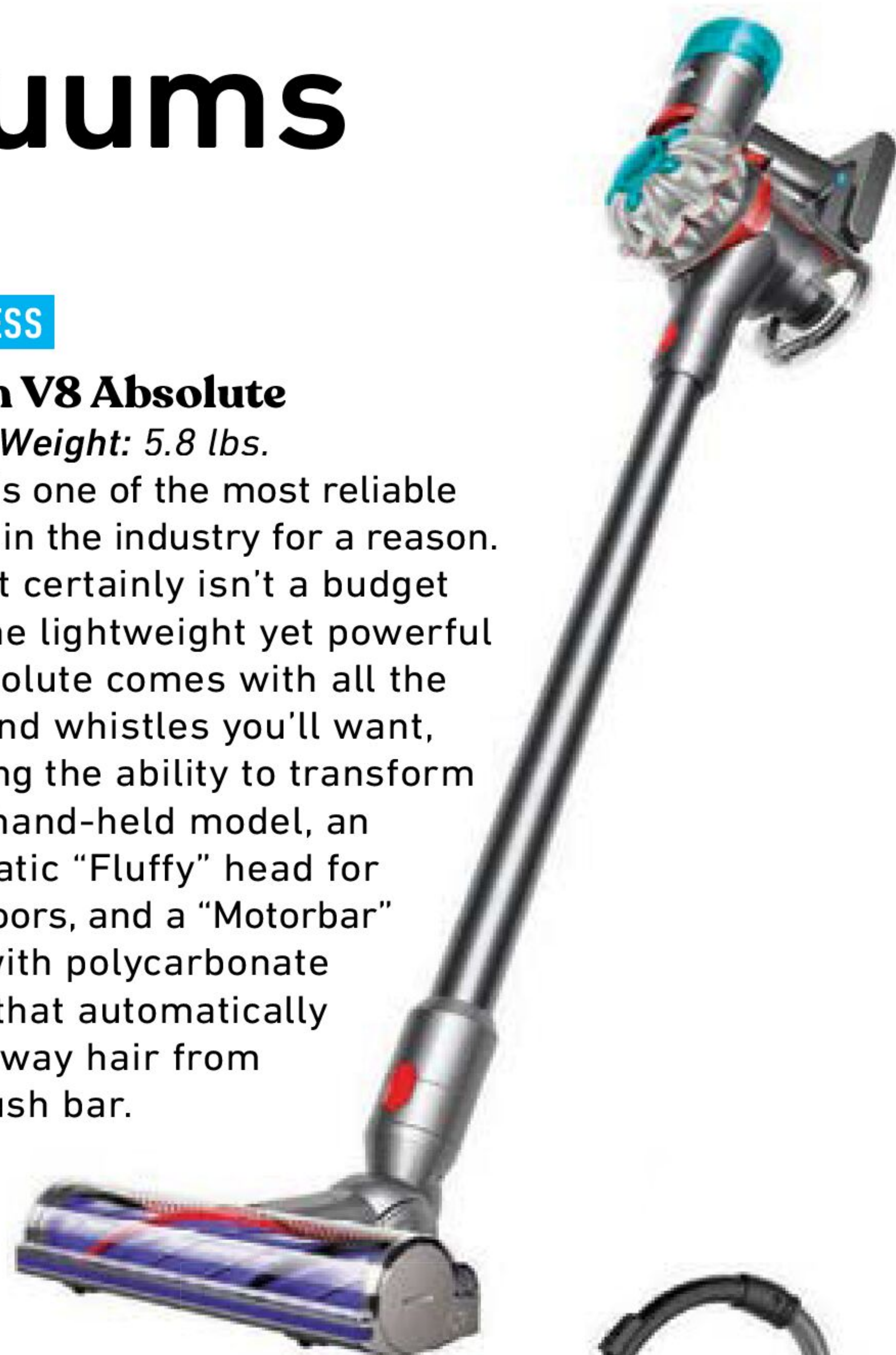
Our top pick is a corded upright option that works wonders on laminate, hardwood, tile and vinyl. Separate the canister from the base to tackle stairs, or use the 5-ft. hose and 30-ft. power cord to access hard-to-reach areas. Precise swivel steering helps you navigate furniture with ease, and a HEPA filter traps up to 99% of dust and allergens.

CORDLESS

Dyson V8 Absolute

\$520 • Weight: 5.8 lbs.

Dyson is one of the most reliable names in the industry for a reason. While it certainly isn't a budget pick, the lightweight yet powerful V8 Absolute comes with all the bells and whistles you'll want, including the ability to transform into a hand-held model, an anti-static "Fluffy" head for hard floors, and a "Motorbar" head with polycarbonate vanes that automatically clear away hair from the brush bar.



HAND-HELD

Black+Decker Dustbuster Pivot Vac 20V Max Cordless Hand-Held Vacuum

\$90 • Weight: 3 lbs.

With tons of suction power for its size, this vacuum is small enough to store in the kitchen, garage or RV. It cleans up common messes without special attachments, using cyclonic action to spin debris away from the filter for optimum suction. The charging base also provides a compact storage solution.



ROBOT

Wyze Robot Vacuum

\$315 • Weight: 7.2 lbs.

This app-controlled smart machine vacuums up hair and debris on both carpet and hardwood, mapping your floors and dividing rooms into sections to create the most efficient path. Have an area that's off limits? Create a "virtual wall" to keep the vac on track. After the job is done, the machine conveniently docks itself for a charge.



GREAT VALUE

Eureka WhirlWind

\$80 • Weight: 8.2 lbs.

Boasting high-quality features for a low price, Eureka's WhirlWind is lightweight, super maneuverable and easy to carry all through the house. The vacuum is bagless with washable filters for even more cost savings, and three suction settings—for carpet, upholstery and hard floors—let you tackle any job.



Shopping for a Shop Vac?

Before you check out, consider these key factors.

- **Mobility:** Wheeled vacs can be moved around large shops easily. To save floor space in a smaller shop, opt for something portable and storable.
- **Durability:** Metal bodies can withstand a beating, but plastic is lighter. Crush-resistant, kink-free hoses keep the air flowing.
- **Storage Capacity:** The larger the storage drum, the less often you'll need to clean it out, but the heavier it will be when full.
- **Power:** High horsepower isn't everything—also look for the suction, expressed in cubic feet per minute.
- **Wet/Dry Functionality:** Most shop vacs can collect liquid and wet debris with a few simple adjustments. If you often need to clean wet messes, be sure to check for this feature.
- **Compatibility:** To use the shop vacuum for dust collection, match its hose size to the dust port of your table saw or planer.
- **Operating Noise:** Look for decibel ratings, consulting user reviews if needed.

Workshop Vacuums



PORTABLE

DeWalt DXV04T Portable Wet/Dry Vacuum

\$130 • Draw: 90 cfm

This 4-gal. corded/cordless vac adeptly handles smaller jobs, using the same filter for wet and dry collection. Already invested in the DeWalt 20-volt system? You can buy the vac as a bare tool, or packaged with a battery but no charger.



GREAT FOR WOODWORKERS

Bosch 14-Gal. Wet/Dry Dust Extractor

\$699 • Draw: 150 cfm

To see this vac really shine, connect the hose to the dust port of a power tool and plug the tool into the vac's integrated outlet. Tool activation then kicks the Bosch on or off as needed. This model is also compatible with Bosch's L-Boxx stackable storage units, allowing you to use the canister as a mobile workstation.



BEST FOR WET/DRY USE

Dustless HEPA Wet/Dry Vacuum

\$580 • Draw: 126 cfm

The ability to switch between wet and dry operation without changing filters makes this a true all-in-one unit. It's also certified airtight, making it particularly useful for tile and masonry cutting. Attach a hose to the threaded spigot and drain liquid waste from the 16-gal. canister at a distance.



WALL-MOUNTED

Prolux Wet/Dry Garage Vacuum

\$480 • Draw: 107 cfm

A wall-mounted vacuum saves floor space and keeps noise away from your work area. The versatile Prolux can vacuum dirt, snow, water or dust, and also can be used to inflate or deflate basketballs and air mattresses. The 32-ft.-long hose can reach from the wall to your workstation, and a clear indicator window lets you know when the canister is near full.

CLOCKWISE FROM TOP LEFT: TATABRADA/GETTY IMAGES; VIA ALTON FOR DEWALT; VIA AMAZON FOR DUSTLESS; VIA PROLUX; VIA BOSCH



Steam Mops

AFFORDABLE AND VERSATILE

PurSteam 10-in-1 Steam Mop

\$80 • Tank capacity: 380 ml

Low price doesn't mean low quality when it comes to this multipurpose mop from PurSteam. The highlight is the built-in hand-held cleaner that can be paired with myriad included attachments, such as a steamer jet (great for steaming clothes!), window squeegee and scraper tool, as well as an angled nozzle for hard-to-reach places. The handle folds down for easy storage too.

SELF-CLEANING

Tineco iFloor 3 Breeze

\$280 • Tank capacity: 600 ml

Reach even the grimmest corners of your kitchen or bathroom with this cordless steam mop from Tineco. The roller brush sucks up both wet and dry messes on hard floors, leaving a streak-free finish, and the self-cleaning function ensures the mop is ready to use day after day. While testing this model, one editor found that it cleaned her floors in half the time that standard vacuuming and mopping would take.

SCRUBS AWAY STICKY MESSSES

Bissell PowerFresh Scrubbing & Sanitizing Steam Mop

\$93 • Tank capacity: 473 ml

This model has everything you could want in a steam mop, including easy swivel steering, three steam settings and a flip-down scrubber for stubborn sticky messes. It comes with extra pads suitable for everyday cleaning and tougher stains, a glider for use on carpets and two fresh-scented discs. The 23-ft. power cord and low-profile head put your whole kitchen within reach. ♦



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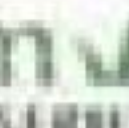
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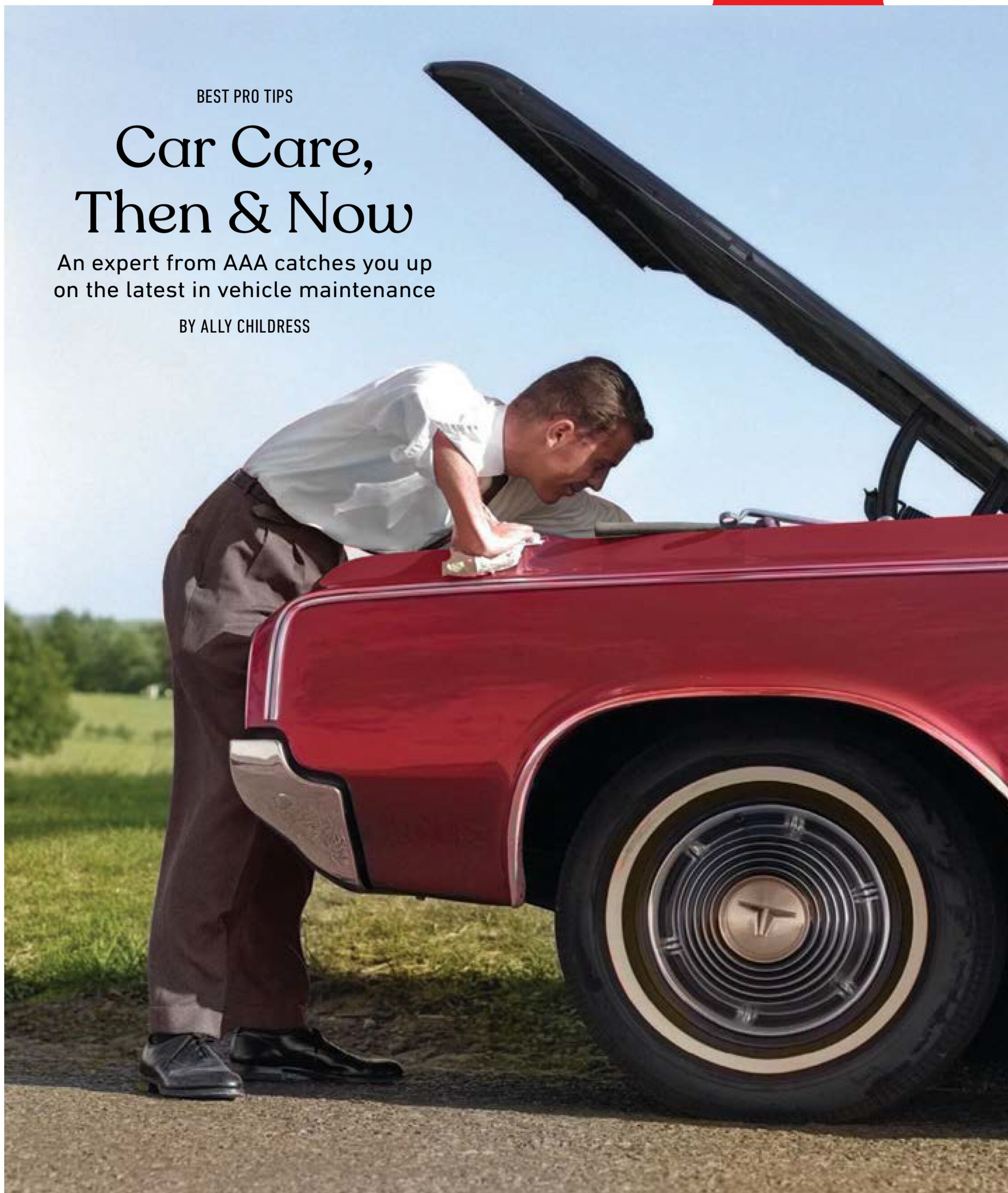
Advice
from experts,
tips from
readers

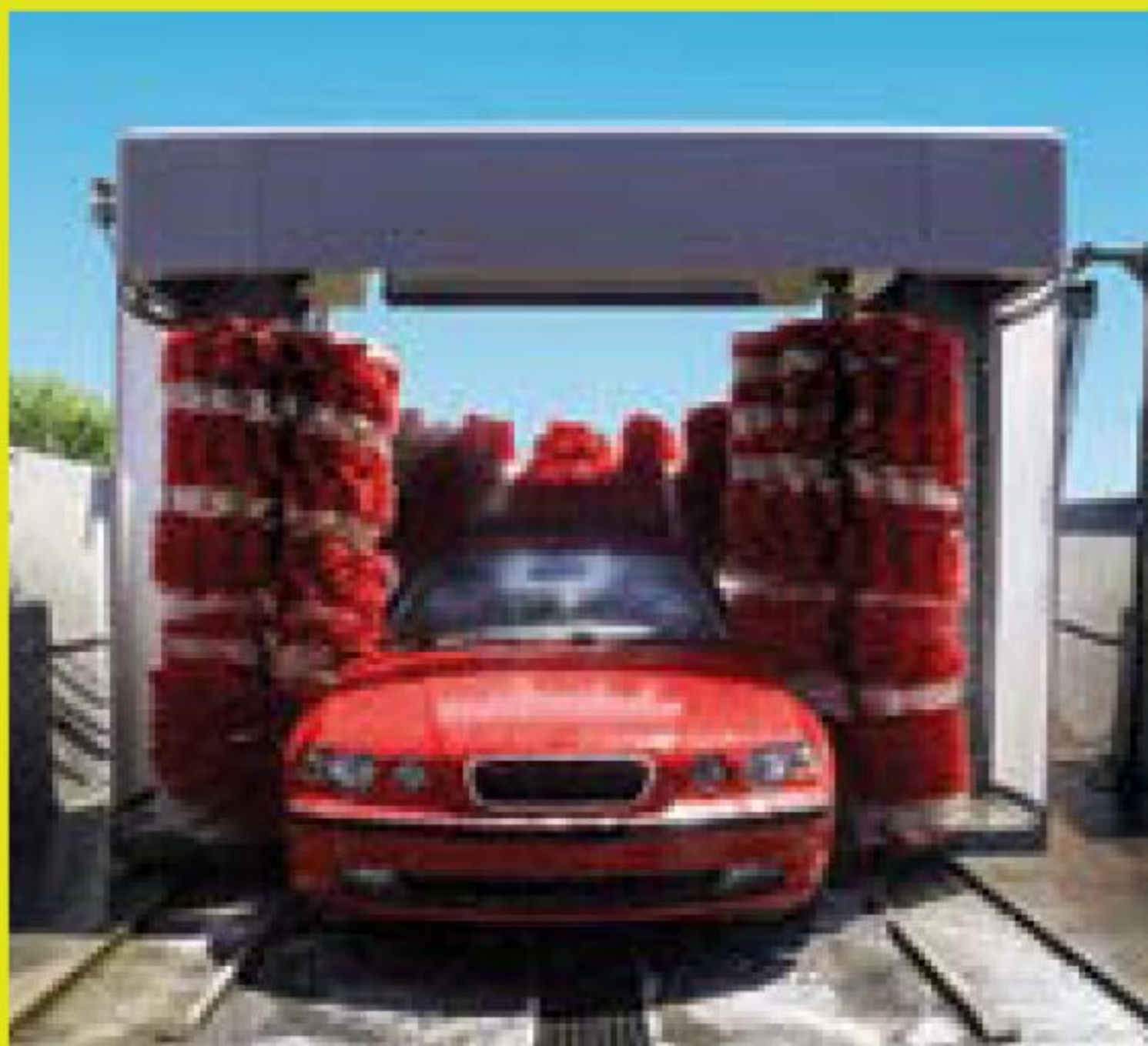
BEST PRO TIPS

Car Care, Then & Now

An expert from AAA catches you up
on the latest in vehicle maintenance

BY ALLY CHILDRESS





Keep It Clean

Wash and wax your car regularly to prevent rust. “And really, waxing it twice a year is all that’s needed,” expert David Bennett says. He recommends putting a coat on before winter and right after to remove salt, sand and chemicals. “Get all of that crud off, so it’s not just sitting on there.”

“Same thing with bugs,” Bennett says. “As they splatter against your paint, if they’re there too long, the acidity level inside the bug can eat through the clear coat.” Bugs clogging your grille can restrict airflow across your radiator too. If you notice lots of bugs on your windshield, they’re probably in the grille, so that’s a great time to go through a car wash.

The more things change, the more they stay the same. That includes car maintenance. David Bennett, ASE-certified master technician and senior automotive manager at the American Automobile Association, has been educating consumers and AAA members on car care for 37 years, and he’s here to let you in on a little secret.

“The basic concept of vehicles has essentially stayed the same, when you’re talking internal combustion engines,” Bennett says. Pistons go up and down, valves open and spark plugs ignite the gas and air mixture inside the cylinders. “Take electric vehicles out, and things really haven’t changed that much.”

I talked to Bennett about what’s new, what’s old and what you need to know to keep your car running for years to come.

You can still fix your own car

First things first. Even with today’s higher-tech cars, Bennett says fluid changes, brake jobs and other common maintenance tasks are DIY-able “as long as you’re comfortable doing it, you do it safely and you understand what you’re doing.” Take an oil change. Bennett says you might have to dig through more covers and connections to get access, but you’re still removing the plug,



draining the oil and replacing the filter, just like people did 50 years ago. As always, be sure to properly dispose of oil and other fluids.

The 3,000-mile oil change

The adage to change your oil every 3,000 miles? Throw that out the window. Bennett says a couple of things have changed over the years: Oil quality has gotten better, and your car has more monitoring capability. “It could be 3,000 miles, if you’re doing a lot of driving, but it could be 5,000 to 10,000 miles.” For other fluids and maintenance, follow the recommended service schedule in the owner’s manual. “It has a detailed list, and that really hasn’t changed since the beginning of time.”

Gasoline 101: octane vs. Top Tier

Gone are the simple days of regular vs. unleaded. Now there are multiple octane ratings, such as premium, mid-grade and regular,





#1 Tool: Tire Gauge

“If you think about the importance of tires, they’re the only thing that connects you to the road. Don’t forget the spare. When you’re checking the pressure in your tires, check the spare as well.”

Build a relationship with your mechanic

Even though you can fix your own car, you may not want to. If you’re intimidated by trying to haggle with a mechanic, Bennett says building trust is key. “The easiest way to do that is to take it in for basic service, like an oil change or a tire rotation,” Bennett says. “Do those things first, and create that rapport before you need a major job done.” It’s kind of like going to the doctor: If you get a quote or diagnosis that seems unreasonable, get a second opinion. ●



Meet the Pro

David Bennett is the repair systems manager at the American Automobile Association (AAA), serving as an expert on car buying and repair.

as well as Top Tier fuel, which has detergent additives to keep carbon deposits from building up. “Do not confuse Top Tier fuel with the octane rating,” Bennett says. “You can have Top Tier fuel at 87 octane.”

In older cars, “knocking” happened if the air and gasoline mixture inside the combustion chamber ignited too soon, Bennett says. Higher octane ratings mean less early ignition. Today’s owner’s manuals specify octane requirements, which you should follow or risk voiding your warranty. (If it’s a recommendation, not a requirement, you can decide for yourself.)

As for Top Tier fuel, look on the pump, or go to toptiergas.com to find some near you.

No more “warming up” your vehicle

“That was back in the carburetor days,” Bennett says. When fuel injection came along, the old practice became obsolete. If you

want to start your car before you brush off ice and snow, that’s fine, but otherwise, waiting to drive isn’t necessary. “Start the vehicle, and by the time you put your seat belt on and adjust the mirrors, the car is ready to go,” Bennett says. “It will warm up quicker driving than it will just sitting there.”

Washington, not Lincoln

Remember the “penny test” for checking tire wear? The edge of a penny to Lincoln’s hair is about $\frac{3}{32}$ in.—the legal limit for tire tread depth—so if you could stick a penny in the tread and see Lincoln’s entire head, it was time to get new tires. Today, Bennett and AAA recommend using a quarter, which measures about $\frac{1}{4}$ in., edge to hair. “If you can see the top of Washington’s head, then it’s time to start pricing and looking for tires.” Always check in a few places in case there’s uneven tread wear (and get that checked out if so).

Easy Wall Rehab

When cracks, holes and popped nails strike, you can smooth things over with some quick tips

BY FAMILY HANDYMAN EDITORS

Whether you need to repair walls in your rental or simply want to stay on top of those dings that add up over time, you don't have to call a pro to tackle common wall repairs. All you need is a toolbox and a little know-how.



Q: What's a good fix for a hole that's about the size of a doorknob?

There are all kinds of ways to patch mid-size holes. But the quickest and easiest is to use a stick-on mesh patch. They're available in a few different sizes at paint stores, hardware stores and home centers. To use the patch, just clean the wall surface and sand it to give the surface a little "tooth." Then stick the patch over the hole and cover it with two or three thin layers of joint compound. You can speed up the process by using setting-type compound for the first coat.

FROM TOP: KLAUS VEDELT/GETTY IMAGES; TMB SUTDIO



Q: How do I cover a crack?

Stress cracks usually show up around window and door openings. The cracks are the result of framing movement and are hard to fix permanently. But using spray-on crack repair is a good way to at least extend the life of your repair. The spray forms a flexible membrane over the crack that can stretch and relax as the building moves. If the crack is open, fill it first with patching compound. Then follow the instructions on the can to cover the crack with the crack-repair spray. Let it dry and cover it with paint to finish the repair. You'll find crack-repair spray at most hardware stores, paint stores or online.

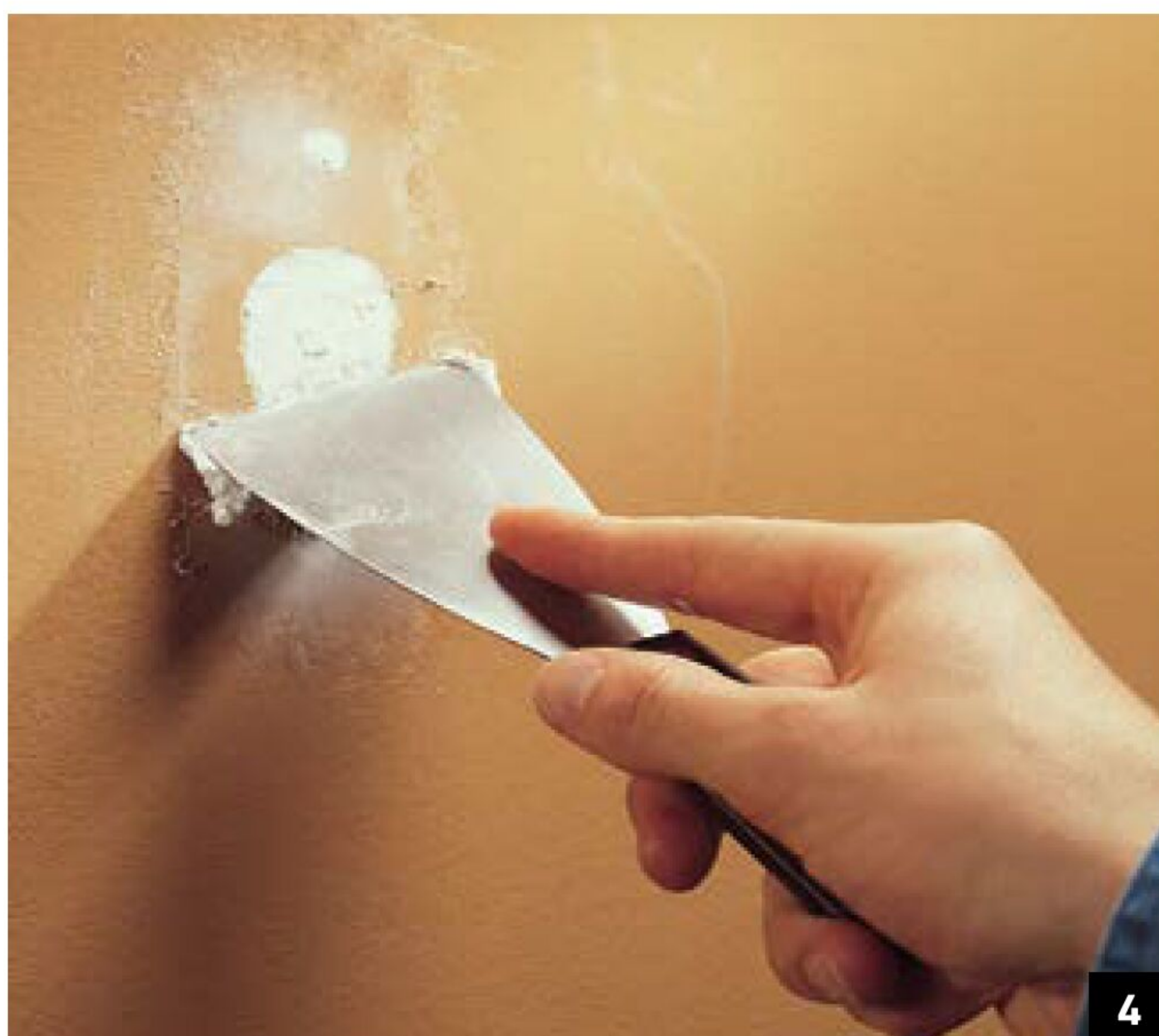
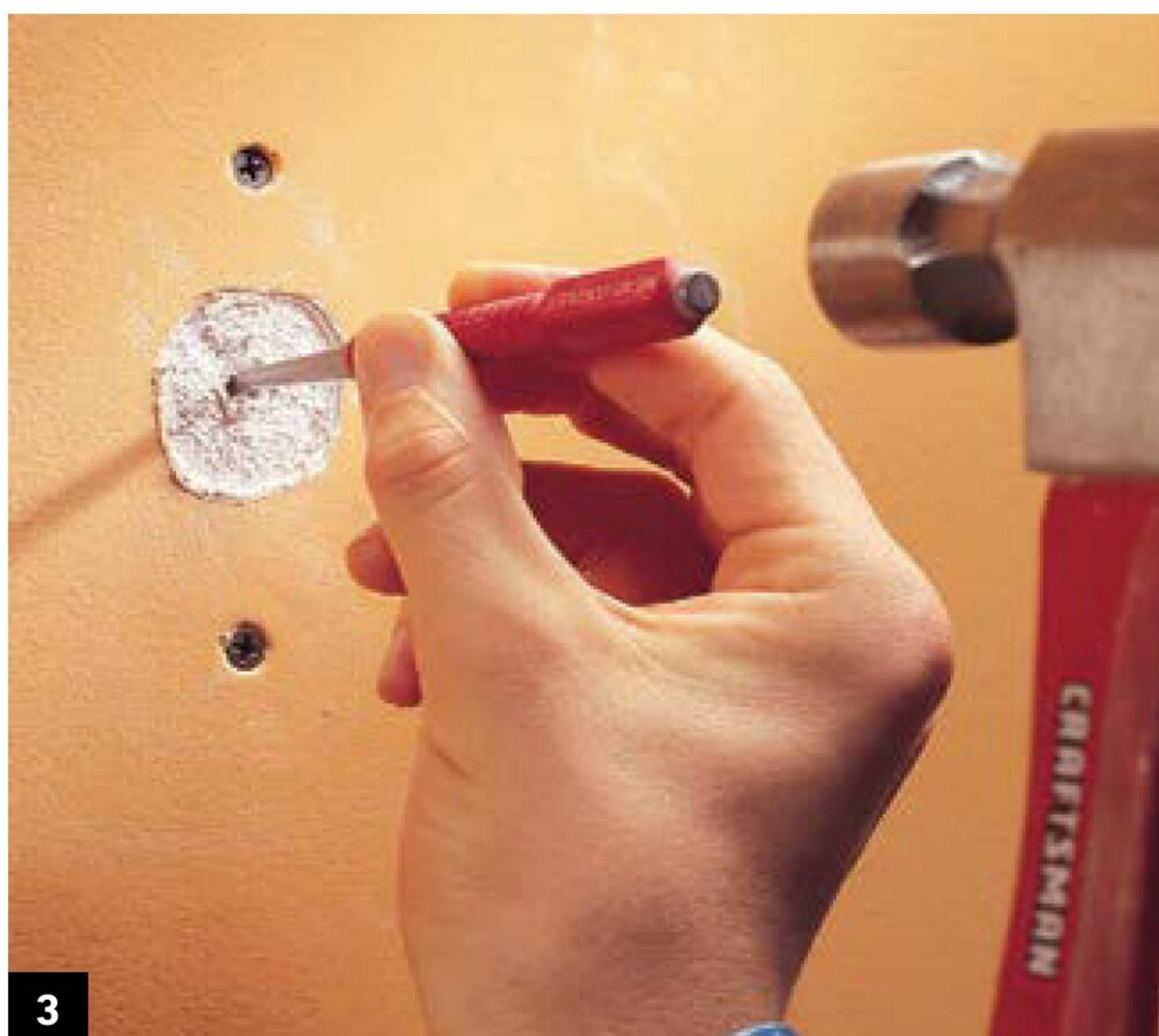
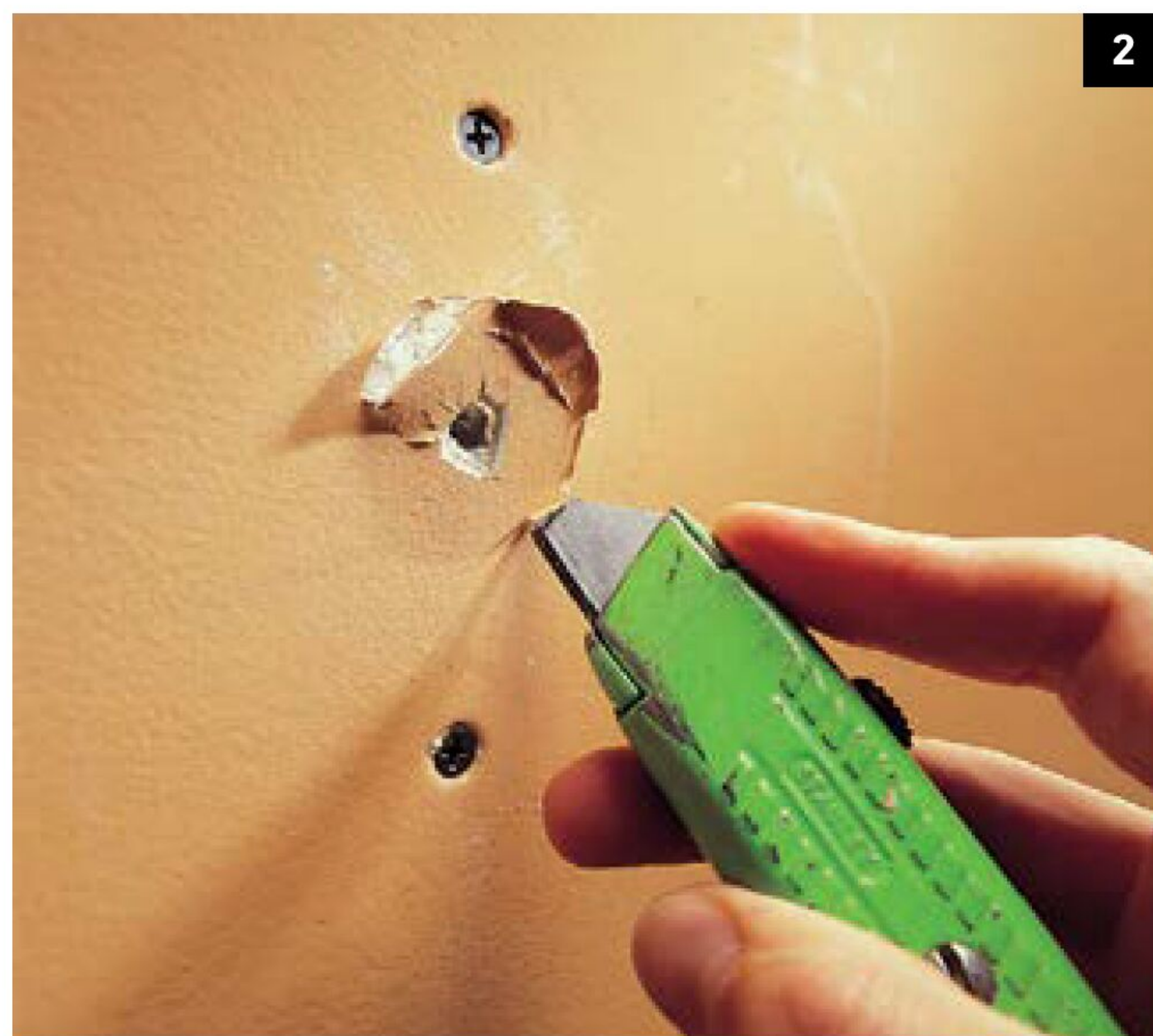
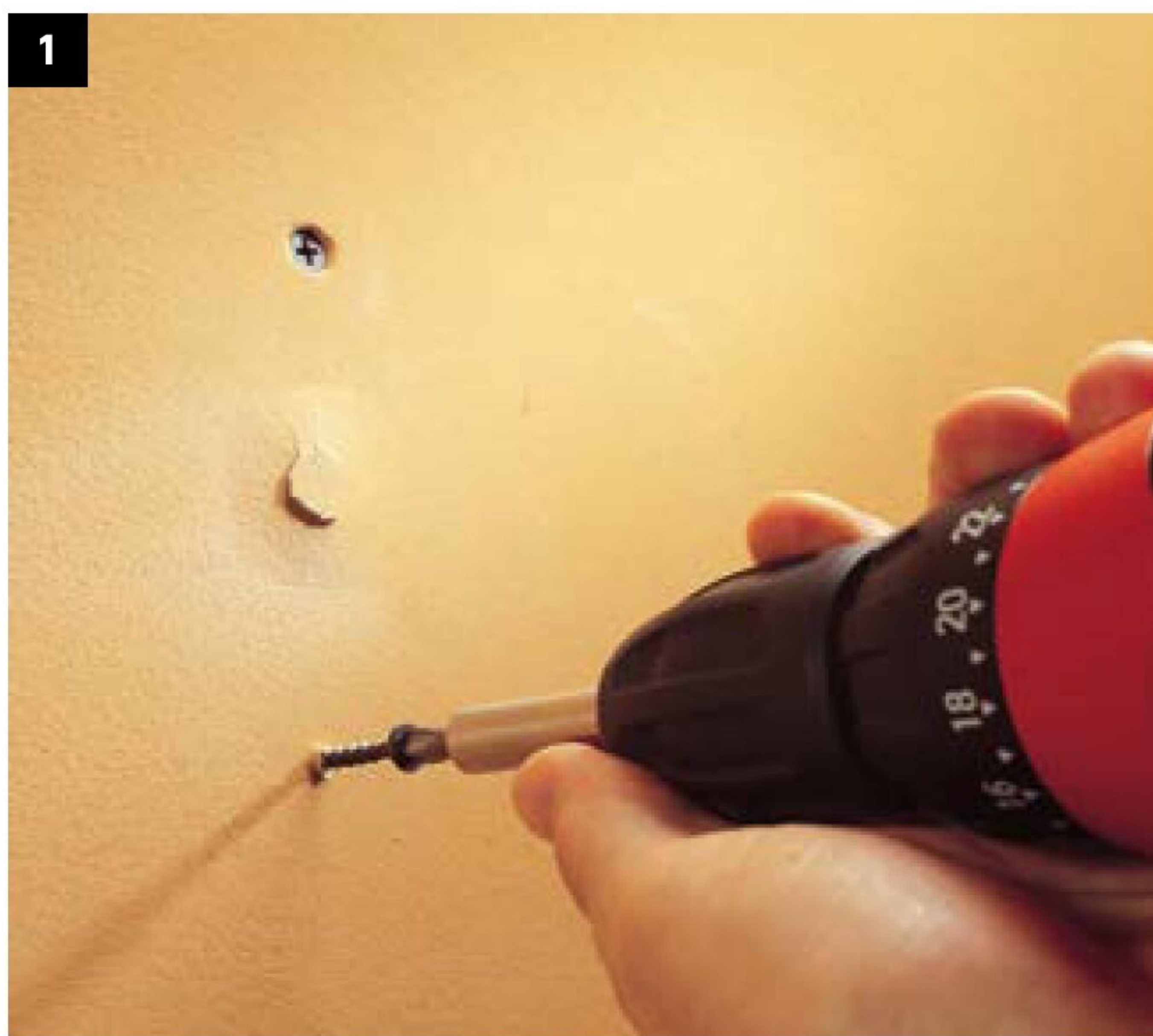
Q: How do I use a raking light when patching walls?

When you're preparing your walls for paint, position a bright light so the beam rakes across the wall as shown here. This will accentuate any defects, making them easier to see and fix, and alert you to patches that need more fill or additional sanding. If your walls look smooth in raking light, you can be sure they'll look awesome when you're done painting.



Detect Condensation

Dry the wall surface with a fan heater, then tape some kitchen foil tightly over the affected area. If the surface of the foil is wet after 24 hours, you have an issue. Condensation occurs when moisture-laden air builds up inside the house. Poor ventilation and over-efficient draft-proofing often are to blame.



Q: How can I fix popped drywall nails and screws?

This quick step-by-step offers an easy solution:

1. Drive new screws. Refasten the drywall with 1¼-in. drywall screws. Drive the screws until they are recessed but don't break through the paper covering on the drywall. If you accidentally drive a screw too deep, add another screw alongside it.

2. Cut away loose material. Cut out crushed or damaged drywall with a sharp utility knife. Bevel the cut and don't leave any fuzzy bits

of paper that would be difficult to cover with your patching compound.

3. Secure old fasteners. Bury drywall nails in the wood framing with a nail set. Back out and remove old screws.

4. Fill with patching compound. Use a flexible putty knife to apply the compound and smooth it. Apply two or three coats, allowing for drying before recoating.

Popped drywall nails and screws are common in old and new homes alike. It's tempting to just pound the fastener back in and fill the divot. But this is

merely a short-term solution. To permanently fix the problem, drive a new nail or screw to reattach the drywall to the framing and remove or bury the old fastener.

We used lightweight spackling compound to fill the damaged area. It dries quickly, doesn't sag and is easy to sand. Expect to apply two or three coats to cover a hole this large.

The drying time between coats will depend on how deep the hole is. Use a fine sanding sponge or 100-grit drywall sanding paper to sand the patch before priming and painting.

Q: How do I find a stud without a stud finder?

Magnets: Wrap a powerful magnet in tape so it won't leave marks on your wall, then hold it where you need to find a stud. Slide it across the wall to find a drywall screw, which will cause the magnet to stick to the wall. Drywall screws are always driven into studs.

Flashlights: Shine a flashlight on the wall, holding it at a shallow angle so the beam illuminates any surface textures. Often drywall screws are betrayed by a small circular dip in the drywall surface where the plaster concealing them dried and shrank. When you locate one, move the flashlight to look for more dips in alignment. If you see some, you've found a stud.

Tape Measures: Most stud walls are built 16 in. on center. That means there are 16 in. from the face of one stud to the same face of the neighboring one. Use a tape

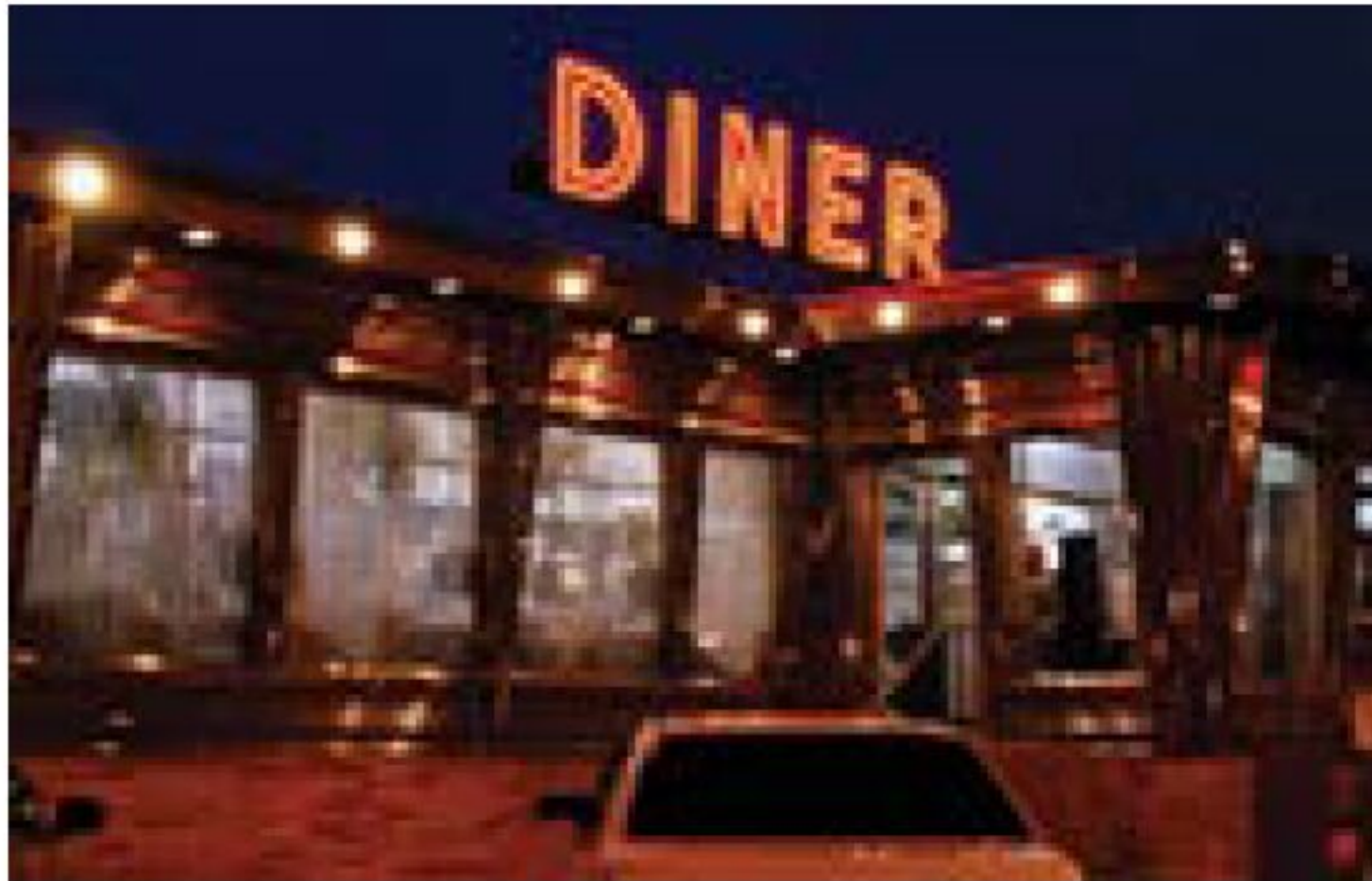


measure to measure over from the nearest corner of your wall in 16-in. sections until you reach the area you need to find a stud.

Knocking: It sounds too simple to work—but it does! The hollow area between studs will give a different sound when rapped sharply with your knuckles than the drywall directly above a stud.

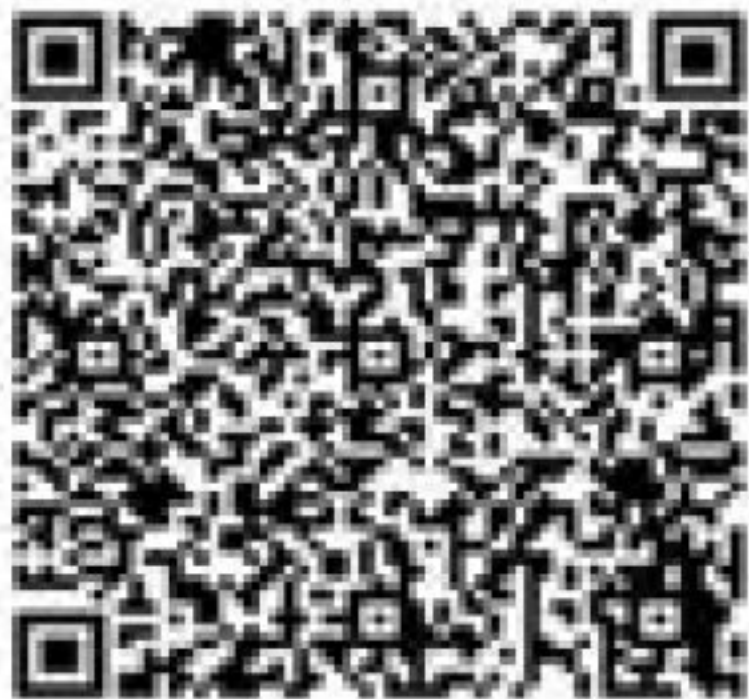
Finishing Nails: Use a small

hammer to tap a finishing nail into the drywall in a spot you know will be covered. You'll know right away if you hit a stud since they provide noticeable resistance to the nail. If you hit nothing, the nail will pierce through the drywall and beyond easily. If this happens, pull the nail out, then try again an inch to the left or right. You're sure to hit a stud before long. ●



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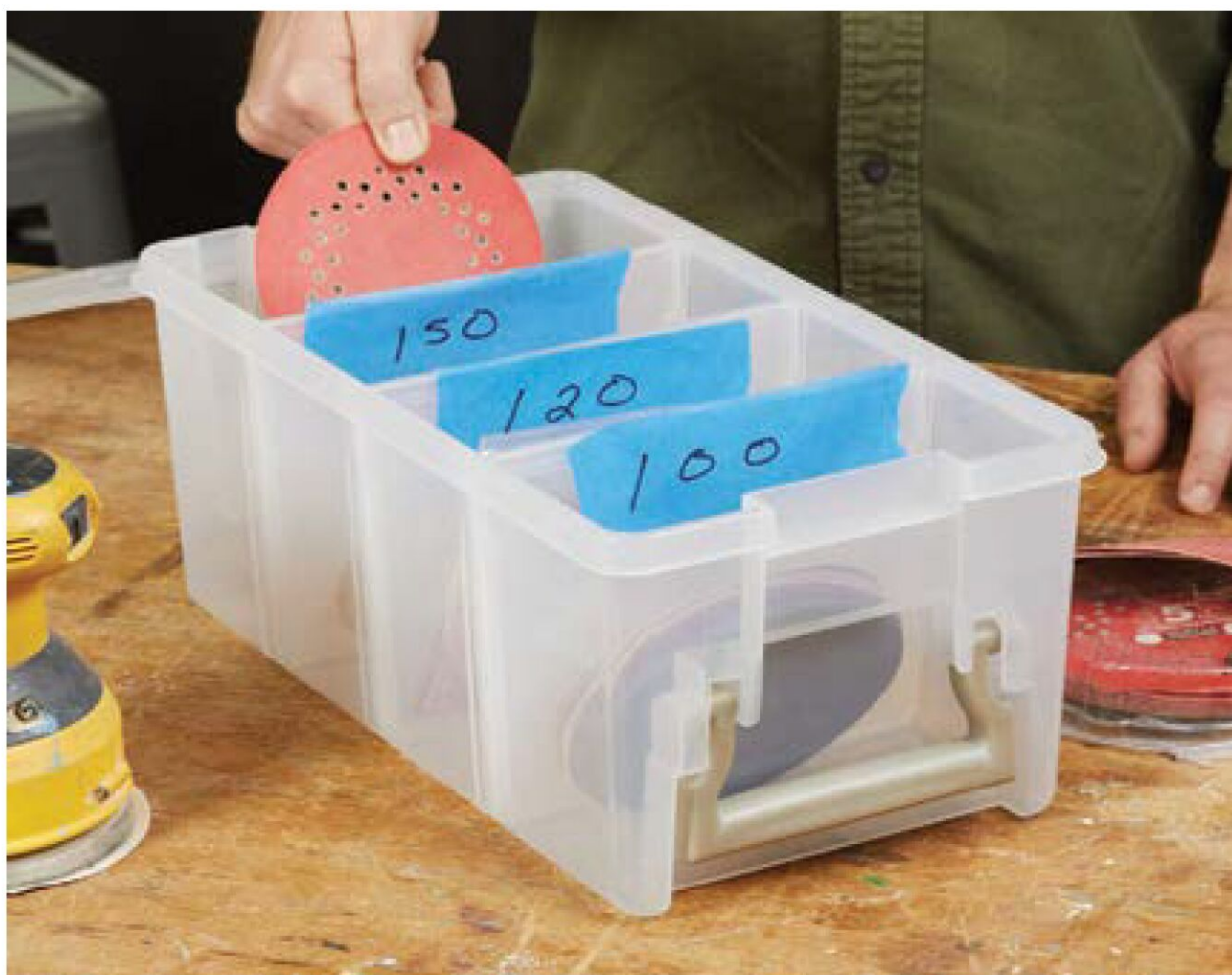
True Grit

Smooth out your sanding projects with these reader-submitted tips

Carpet Cushion

Don't scratch up the workpiece you just sanded by flipping it over on a dinged-up workbench. The next time you sand a project, lay down a scrap piece of carpet to protect the wood, keep it stationary as you sand and dampen the sander vibrations on your hands. No scrap carpet around? A cheap washable runner works great—just shake it out between jobs and roll it up for easy storage. —Dan McGuinn





Crafty Storage Solution

To keep my sandpaper organized in my workshop, I separate each grit in the different compartments of an arts and crafts organizer, labeling each section. —Simone Wallace



Workbench Sandpaper Slicer

Cutting sandpaper is a quick way to dull your scissors or utility knife blade. Instead, I fastened a hacksaw blade to the edge of my workbench. Slipping a washer behind the blade at each of the mounting holes allows a sheet of sandpaper to easily slide in the gap. I fold the paper where I want to cut, just as a reference, then slice along the line. —Kim Boley



Custom-Made Sanding Bows

I cut strips from cloth-backed sanding belts and screw them to shop-made wood bows of different thicknesses to shape and smooth furniture parts and lathe-turned projects. The coarser grits remove wood quickly, and the finer grits really shine up curved surfaces. I screw on the strips with varying tension to best fit the job at hand. —Keith Fisher



Hole Saw Sanding Hack

If you need a drum sander but don't have one handy, cut out a strip of sandpaper to fit around a hole saw, secure it with tape, attach it to your drill and begin sanding. —Russell Ellis

“I used a bit of spray adhesive to affix a piece of sandpaper around a paint stir stick. Voila! An instant woodworking file!”

—Dan Robinson

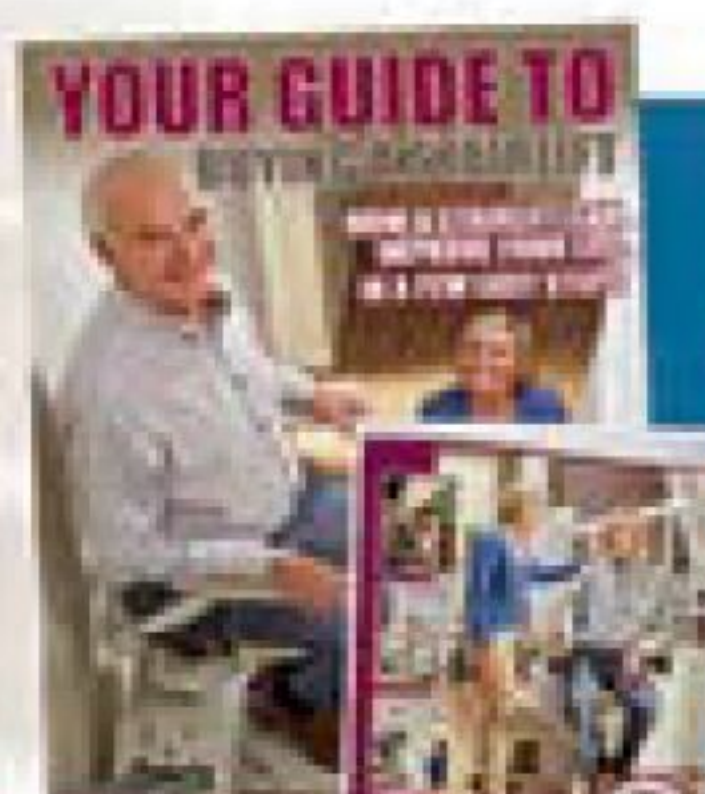
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Built-In Bottle Storage

A Family Handyman reader added a surprising element to his entertainment area



I have a small basement where I enjoy hanging out with friends. In addition to the mini fridge I installed by creating an opening in the wall, I wanted a spot to store my bourbon collection. My space was limited, so I had to get creative. I built a unique cabinet hidden behind a framed painting of Albert Einstein. I started by relocating the studs to allow for the rough opening. Next, I framed the opening with some spare 2x4 and 4x4 framing studs I had lying around. I installed all the wood with wood glue and a few spare corner brackets. The cabinet itself was repurposed. I epoxied in LED lighting and finished it off with a rub-on poly.

—Chris Schultz Arlington Heights, IL ●



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